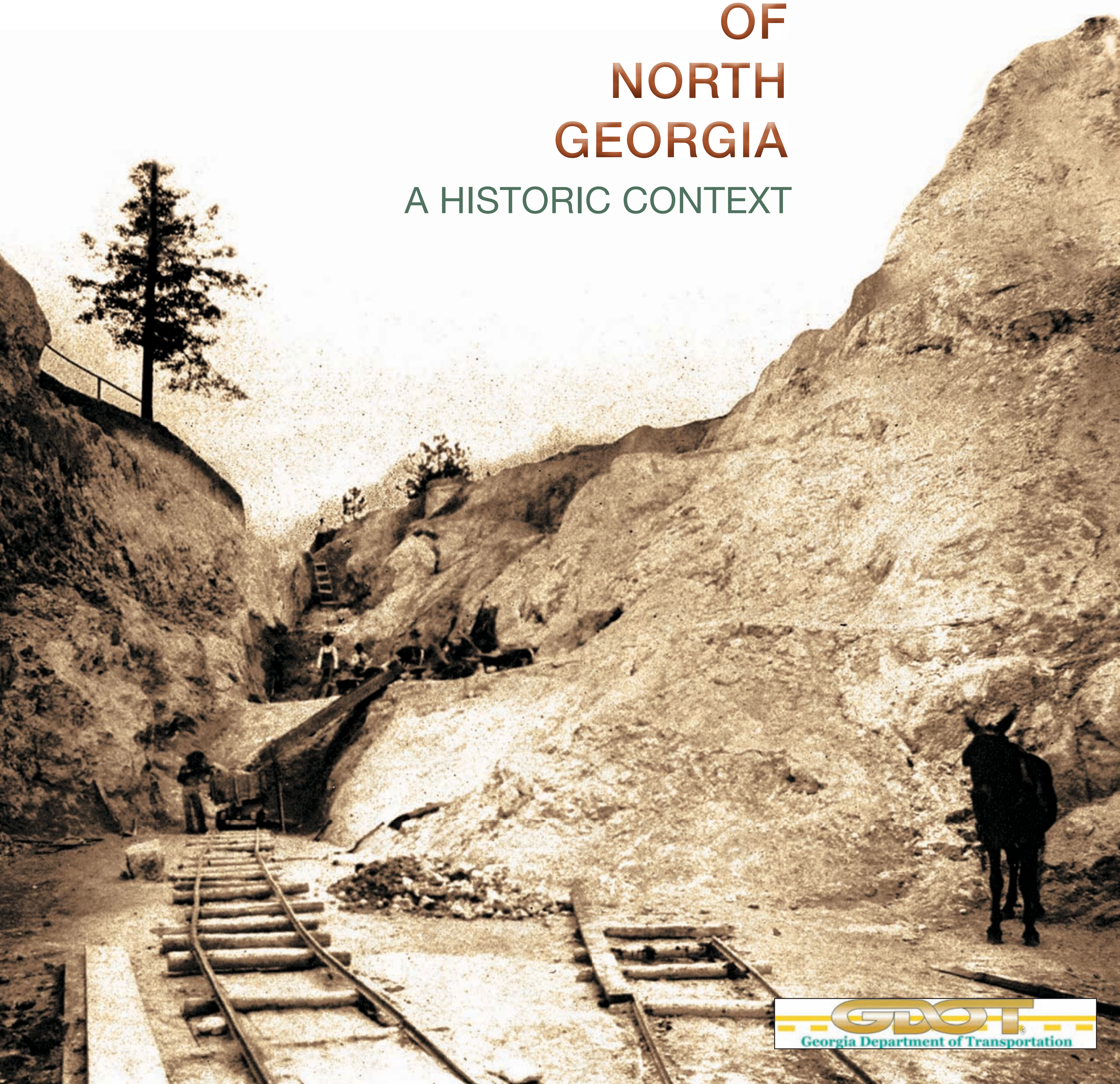
MINING AND MINERAL INDUSTRIES OF NORTH GEORGIA

A HISTORIC CONTEXT



Georgia Department of Transportation

Mining and Mineral Industries of North Georgia: A Historic Context

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Abstract

The mineral resources of Georgia north of the Fall Line are extensive, but the history of their recovery and processing as well as the property types associated with mining in the state are not well understood. This historic context reviews the approaches to survey and identification of mining sites; the economic minerals of the state; provides a short history of mining by resource; and discusses the property types associated with various mining activities. A discussion of the evaluation procedures for assessing the eligibility of mining properties to the National Register of Historic Places (NRHP) is also provided. Appendices provide summary data on historically reported mining operations in the study area.

Acknowledgements

This historic context for mining in north Georgia was developed as a collaborative effort between the project's consultants – New South Associates and Post, Buckley, Schuh & Jernigan; the project's sponsor – the Georgia Department of Transportation (GDOT), and the Georgia Historic Preservation Division/State Historic Preservation Office (GA HPD/SHPO).

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Keith Seramur and Edward Flicker of Geoarchaeology researched and developed the overview of economic minerals of Georgia that appears in Chapter III; the summary of mineral resources by county that appears in Appendix 1; and the mapping of mineral resources that appears in Appendix 2. Their participation in this project is greatly appreciated.

At New South Associates, Historian Kristen Puckett developed the resource tables, which appear in the Appendices. Jennifer Wilson edited the report. We are also appreciative of the review and comments offered by New South Associates' President, Mary Beth Reed, who is knowledgeable of north Georgia mining resources herself through her work with the iron industry of the Etowah Valley and the granite industry at Stone Mountain.

To all, please accept our thanks for your assistance.

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I. Introduction

Mining was a significant facet of the north Georgia economy and left a heritage of features that can still be read on the landscape. The Dahlonega gold rush, the granite industry of Elberton and Stone Mountain, and the iron industry of the Etowah Valley are known to many as important events in Georgia's history, but a host of other metals, non-metals, and mineral fuels – such as bauxite, manganese, chlorite, marble, talc, and coal – were extracted from the state at various times, using several techniques, and for a variety of uses (Figure 1).

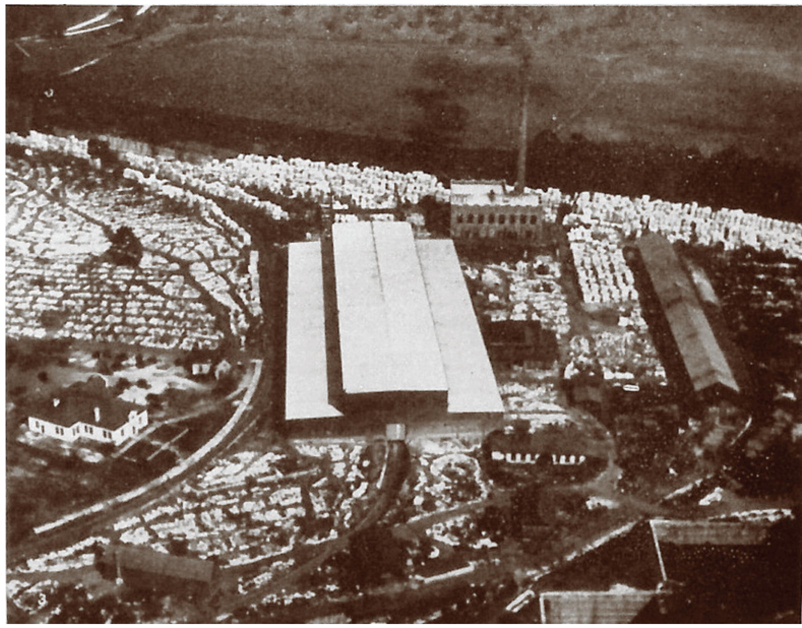


Figure 1. Mineral industries in Georgia included numerous products and had substantial impacts on the landscape. The Georgia Marble Company Works, Pickens County (Source: Furcron et al. 1938).

While mining was an important historic economic activity in the state, it is an activity that is not well known. The sites, structures, landscapes, and material culture associated with mining have not been systematically examined and related to historic settings useful for interpreting them and evaluating their historical and archaeological significance. This study provides a historic context for the identification and evaluation of cultural landscapes, archaeological sites, and structures associated with historic mining in north Georgia.

The project area covered by this study is north Georgia, defined here as the area north of the Fall Line (Figure 2). Moving from southeast to northwest, the physiographic provinces included in this area are the Piedmont, Blue Ridge, and the Valley and Ridge (which includes the Appalachian Plateau). While mining took place throughout the state historically, most of the economically important minerals came from the region north of the Fall Line and mining had its greatest historical impacts here.

This context was developed through researching the history of mining in north Georgia and archaeological and historical studies of mining sites in the state. Publications of the Georgia Geological Survey were useful in summarizing the deposits, companies, and events associated with mining activities. A variety of sources were consulted to develop an understanding of the property types associated with historic mines and the approaches to their identification and documentation, including Noble and Spude's (1992) Guidelines for Identifying, Evaluating, and Registering Historic Mining Properties: A Historical Context and Research Design for Mining Properties in California (2008) prepared by the California Department of Transportation (CALTRANS); Hardesty's (1988) The Archaeology of Mining and Miners: A View from the Silver State; and the National Park Service Bulletin Guidelines for Evaluating and Documenting Rural Historic Landscapes (McClelland et al. 1999).

This context is organized as follows. The Approaches to the Survey and Identification of Historic Mining Properties are presented in Chapter II and provide guidelines for archaeological and historical research, as well as field methods for use in the survey and identification of mining sites. Chapter III presents the Economic Minerals in Georgia and provides an overview of the state's geology and the distribution of geological deposits in the state. Chapter IV provides a History of Mining with summary histories

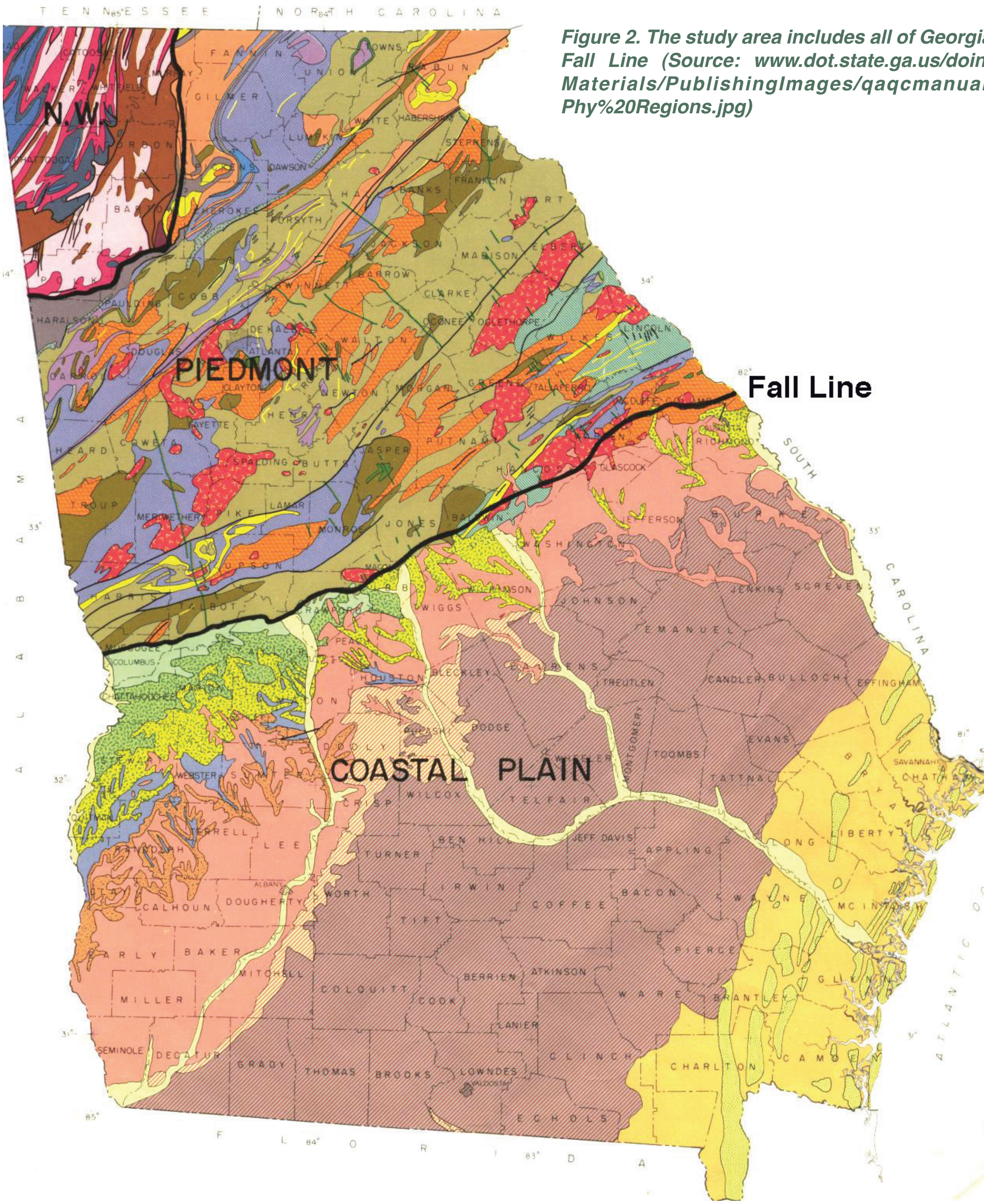


Figure 2. The study area includes all of Georgia above the Fall Line (Source: www.dot.state.ga.us/doingbusiness/Materials/PublishingImages/qaqcmanual/4.5.1%20Phy%20Regions.jpg)

of the metal, nonmetal, and mineral fuels. Chapter V discusses the Processes of Mining and reviews the techniques used to extract various resources. Chapter VI presents the Property/Resource Types associated with mining in Georgia, including extractive properties, processing properties, and associated properties. National Register of Historic Places Evaluations are the topic of Chapter VII, which reviews research considerations for evaluation of archaeological mining properties as well as significant events, individuals, and features for consideration in the evaluation of historic mining properties. Finally, Chapter VIII presents a Summary of the historical elements of mining and offers perspectives on future research. The References Cited follow this chapter, while Appendix 1 contains summary tables listing mining properties, by resource and land lot, as recorded by the Georgia Geological Survey. Appendix 2 provides GIS mapping of known mineral deposits and resources in north Georgia. These maps are critical in assisting cultural resource surveyors in identifying what mineral resource was the objective of mining properties that they encounter during fieldwork. Appendix 3 then provides tables listing mining properties of the late nineteenth and early twentieth century, as reported by the Georgia Geological Survey. Although not a comprehensive listing of all mining properties in the state, these tables may assist researchers in determining the historic associations of resources they encounter. Finally, Appendix 4 contains an archaeological research design for use in assessing mining properties as archaeological sites.

II. Approaches to the Survey and Identification of Historic mining Properties

The objective of this historic context is to provide guidelines for evaluating cultural resources in north Georgia related to mining and mineral industries. Evaluating these types of resources requires determining how they convey the context through specific historic associations, architectural or engineering values, or information potential. Before making this determination, however, it is necessary to ensure that historic properties consisting of mines and/or related resources are properly identified and recorded.

Historic mining sites are unusual cultural resources and encompass a variety of historical and cultural properties. They are often large sprawling resources that cover expansive tracts of land. Moreover, seemingly isolated structures and features may have historical relationships as discrete parts of a single mining operation. Moreover, the location and functioning of mining sites often have close connections with the physical environment. Because of these qualities, identifying and evaluating historic mining resources often requires approaching them as historic landscapes containing historical and/or archaeological features. The National Register of Historic Places definition of a historic rural landscape is "a geographical area that historically has been used by people, or shaped or modified by human activity, occupancy, or intervention, and that possesses a continuity of areas of land use, vegetation, buildings, and structures, roads, waterways, and natural features" (McClelland et al. 1999:1-2). While sites related to mineral extraction and processing are not necessarily in rural areas, they can are often identified, evaluated, and studied with reference to a geographical area rather than to individual features, sites, or structures.

Although historic mining properties are common in north Georgia, their large size and unique attributes make them challenging to identify and record during surveys and evaluation studies. This chapter outlines procedures for surveying, identifying, and recording historic mining sites in north Georgia.

MINING PROPERTIES IN NORTH GEORGIA AS CULTURAL LANDSCAPES

Historic mining sites may consist of large, sprawling, highly visible sets of features, structures, and landscapes. Identifying and delineating them during cultural resource surveys poses difficulties not met with more traditional compact resources. These properties include the obvious vestiges of mineral extraction, such as mines and waste piles, an array of processing and transportation facilities, and support structures such as powerhouses, offices, and blacksmith shops. They can also include extensive underground components, broad areas of unused space, and housing for workers and their families. Hence, the survey of historic mining properties is best accomplished through a cultural landscape approach that identifies and records all properties, both sites and structures, associated with a mining operation (Figure 3).

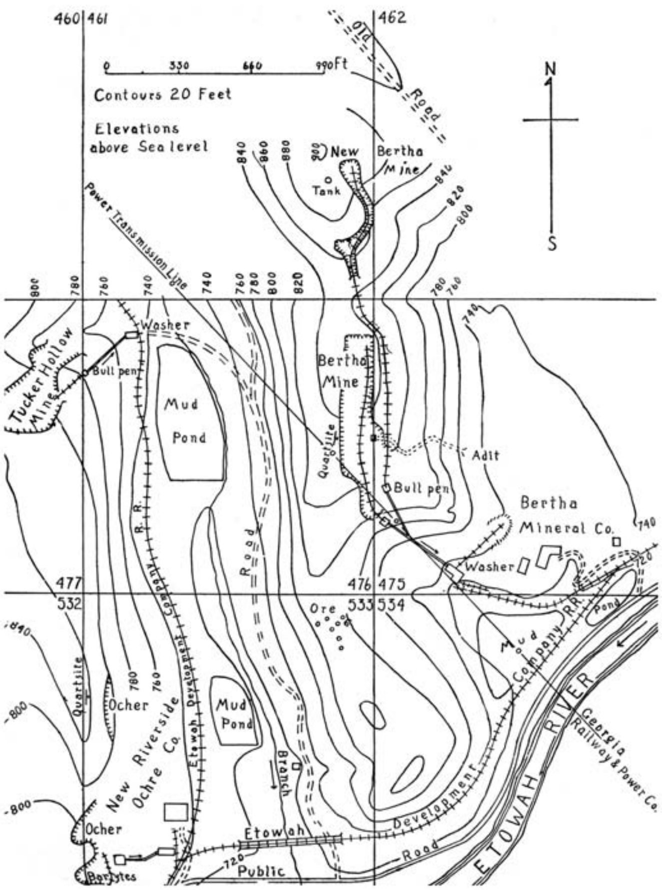


Figure 3. A typical mining landscape near Cartersville, Bartow County, showing the association of natural and manmade features related to mineral industries (Source: Hull 1920).

Viewing historic mining properties as parts of rural historical landscapes can link isolated features and structures that appear to have no significant historical or functional associations. Rural historic landscapes may include industrial types and "contain significant areas of vegetation, open space, or natural features that embody, through past use or physical character, significant historical values. Buildings, industrial structures, objects, designed landscapes, and archaeological sites may also be present" (McClelland et al 1999:3). McClelland et al. (1999) provided a classification system of 11 characteristics to assist in reading a rural landscape and interpreting the natural and cultural forces that acted on it. McClelland et al. (1999:3) defined the landscape characteristics as "tangible evidence of the activities and habits of the people who occupied, developed, used, and shaped the land to serve human needs." Further, they might reflect beliefs, attitudes, traditions, and values of the people who created them. The 11 characteristics are divided into two groups: processes that have shaped the land, and physical components that are visible in the landscape.

The four characteristics classified as processes are: Land Uses and Activities; Patterns of Spatial Organization; Response to the Natural Environment; and Cultural Traditions. When addressing historic mining properties in north Georgia, these characteristics can help in understanding how and why a mining landscape was developed, arranged, and changed over time. The seven characteristics grouped as components of the landscape are those features that illustrate the way a historic landscape was developed and organized. These include Circulation Networks; Boundary Demarcations; Vegetation Related to Land Use; Buildings, Structures, and Objects; Clusters (of buildings, structures and other features); Archaeological Sites; and Small-Scale Elements. McClelland et al. (1999:4-6) described these concepts in detail and provided specific examples of each (p.15-18) in Guidelines for Evaluating and Documenting Rural Historic Landscapes. Components of mining landscapes in Georgia would include, among others, underground workings, tailings, roads, railroads, tipples, washing plants, stamp mills, storage bins, retaining ponds, water delivery and drainage systems, blacksmith shops, stables, offices, and houses.

A guideline for considering mining properties in north Georgia as historic landscapes might entail considering how the land has been shaped and manipulated to extract, process, and deliver mineral resources. Mining landscapes should show evidence of specific land use practices, transportation networks, vegetation patterns, large and small elements that are distinctive of mining, buildings, and structures, as well as illustrating how these characteristics functioned together within a geographical area.

SURVEY/IDENTIFICATION

Historic mining properties might be encountered during National Historic Preservation Act Section 106 cultural resource surveys, or sought during site delineation studies as part of a National Register of Historic Places evaluation. The majority of property types associated with mining in north Georgia consist of shafts, trenches, cuts, and quarries, although aboveground buildings and structures also survive. Reviews of archaeological site file data suggest that many of these property types are not recorded as archaeological sites because of a failure to recognize cut banks, prospecting pits, and other features as "historic." Such features and structures are often omitted during historic structure surveys because they do not have clear associations with mining activities or they are not identified as related to mineral industries. The first step in finding these resources is recognizing their characteristics and context.

Archival research is more important in identifying mining properties than it is for most cultural resources surveys. Site-specific or study area-specific documentary research prior to conducting fieldwork is necessary to determine the general mining practices used in a region and specific mining sites that might occur in an individual survey area (Hardesty 1988:108; CALTRANS 2008:156). Maps and other archival sources, such as historic aerial photographs and local histories, can indicate the presence of mines in a project area and the types of mineral extraction and processing activities involved. Documents also provide information for developing initial models of mine types and their probable locations (Hardesty 1988:108; 2010:21). This preliminary knowledge familiarizes surveyors with the feature types expected and helps to accurately identify any found during the fieldwork (Noble and Spude 1992:7). Appendices 1 to 3 of this document provide much of this preliminary information, including maps of geological resources in north Georgia and summary tables of late nineteenth-century mining properties by resource type and land lot. Surveyors should refer to these sources as starting points for the identification of mining properties.

Consideration of types of mining can also help to develop preliminary models of site locations. Placer mining (which extracts minerals from alluvial deposits) typically follows drainages. Lode mining (which takes minerals directly from primary deposits) was oriented with respect to geologic structures (Noble and Spude 1992:6). Hardesty's (1988:108, 2010:21-22) study of Nevada mines suggested that mine locations were mainly related to ore distributions, while factors such as water, towns, and transportation venues provided secondary influences. Appendix 2 provides maps of north Georgia's mineral resources, mines, and prospects. These data can be used to determine what resources were sought in a particular locality and suggest the types of mining involved.

Documents yield an important but limited source of information on site locations. For instance, they could be overly optimistic about the size of particular mines and the scales of production. Moreover, while they could indicate the location of a mine and its major components, they do not always provide details about its mundane features, such as shafts, adits, outhouses, and trash scatters (Hardesty 1988:108-109, 2010:22). Many of these kinds of features, however, are visible either at the surface or through archaeological methods and can be located through fieldwork.

The nature of mining sites requires different survey and identification strategies than more discrete resources. For example, archaeological survey approaches using fixed-interval shovel test surveys (typically at 30-meter intervals) may identify individual mining properties only as isolated features, if they are recognized as cultural resources at all. Archaeological surveyors should visually inspect locations for the appearance of historic excavations that may indicate the presence of a mining site. Such surface features are discussed in greater detail in Chapter VI and include pits, shafts, trenches, and open face cuts, as well as tailing piles, railroad and roadbeds, mill/processing structure foundations, and ponds. In such instances, greater use of pedestrian survey is necessary to identify similar and related properties and features. Shovel test survey should be employed in locations where historic mapping or field conditions suggest mill remains, administrative structures, workers housing, and other types of occupations may be present, but should not be relied on to define the boundaries of historic mines. In addition, involving industrial historians, historians of technology, landscape architects, mining engineers, and geologists in the field in addition to cultural resource specialists would help in identifying and interpreting properties (Noble and Spude 1992:9; McClelland et al. 1999:7). These professionals can also provide important assistance with pre- and post-survey archival research.

Recording historic mining properties in the field should be accomplished with a sub-meter accurate GPS and digital camera. Where mining properties are identified, survey should be expanded to identify and record associated properties. Components of mining properties, such as shafts, adits, and other structures, are often visible at the ground surface as distinct excavations, and hence, visual survey is capable of recognizing them. Survey for mining properties is best completed during winter months when ground cover is minimal. At other times of year, tighter interval pedestrian spacing and/or the use of zigzagged transects may be used to identify surface remains. Features representing associated mining properties should be recorded as rural landscapes (cf. McClelland et al. 1999).

It is important to correctly identify specific feature types. A typology of mining features or property types will assist in accurately characterizing the mining processes being identified and their chronologies (CALTRANS 2008:156). The property types known or expected in Georgia are described in Chapter VI.

Different sets of features and activities at mine sites require varied approaches to identification and documentation. Residential areas or camps associated with mining operations usually leave less obvious archaeological expressions than the larger industrial features of a site. In instances where these kinds of activities were known to be present, systematic archaeological surveys should be used to supplement the intensive pedestrian survey. In areas containing large features associated with the major mining activities, however, subsurface testing is generally not necessary and would not justify the effort put into it. This is particularly true for features like tailings and waste rock piles (CALTRANS 2008:156). The unused spaces between areas of intensive activity generally do not contain substantial cultural resources related to mining. Nevertheless, some form of sampling should be applied to these

Figure 4. Mining sites can include widely separated components. Durham Coal Mine, Walker County (Source: McCallie 1904).

areas. Hardesty (1988:109, 2010:23) recommended dividing the areas into transects and surveying a percentage of them.

Metal detector survey, or the use of a magnetometer, is recommended for the identification of remnant architectural and landscape features, including railroad rails and spikes in potential rail beds, structural remains from processing areas, and nails from residences and other structures. Metal detector survey should be used judgmentally on mining sites to aid the determination of integrity; for example, if rails do not appear to remain in railroad bed locations, then is it likely that the mining site has been salvaged after abandonment, which effects the site's integrity. A magnetometer can be used to map the subsurface placement of metal remains, such as rails, as well as buried metal processing facilities and equipment. Ground penetrating radar can also be used to record the subsurface elements of mine structures.

Light Detection and Ranging (LIDAR) data, if available, is extremely useful for identifying mining site features and their locations. LIDAR records subtle differences in surface contours, and can be used on mining sites to reveal excavation locations

The expansive and discontinuous nature of mining sites is another consideration in identifying them. Unlike more "traditional" sites, mining sites often do not consist of a continuous scatter of artifacts and features but rather they may contain components that are widely separated from one another (Figure 4). Identifying these widespread sets of features is necessary to completely reconstruct and understand an individual mining operation. Therefore, field searches must be comparatively intense and widespread to ensure that all related features and activity areas are identified (Hardesty 1988:109, 2010:21; McClelland et al. 1999). Furthermore, "site" boundaries should utilize a cultural landscape approach and site documentation should incorporate all of the mining related properties identified within a survey tract, unless historical documentation indicates they reflect separate sites.

The underground components of mine sites (shafts, drifts, and other structures) must be considered, although these kinds of features present significant obstacles to survey and recordation. Hardesty (2010:46) asserted that they could contain significant information about chronology and activities associated with particular mines. However, because of the unstable nature of these features, they should never be entered except under the supervision of mine-safety experts (Hardesty 1988:27, 2010:49; CALTRANS 2008:177). The locations of these features can sometimes be determined on the basis of surface remains or where they have been exposed during later open pit excavations (Griffin 1974:18-19; Noble and Spude 1992:9). Remote sensing techniques such as GPR can be used to detect the presence of filled mine openings but should be used with extreme caution (Noble and Spude 1992:9). Archaeological geophysical prospecting techniques typically have a limited depth range of 1-3 meters, depending on soil conditions, giving them limited usefulness for locating deeper structures. Given the dangers of entering and exploring historic underground mines, an accurate understanding of their technology and features can only be obtained after subsequent mining operations or collapses exposed them (Heritage Victoria 1999:3).

Regarding safety, mining sites potentially possess certain unique hazards that must be accounted for during survey and recordation (Figure 5). Specific hazards to beware of include covered, unmarked, or obscured shaft openings. The ground surrounding mine openings can be unstable and care should be used in their vicinity. Low spots or depressions should not be entered because they can be thinly covered shafts. Mining operations used explosives, which can be found in any part of the mine site. Any

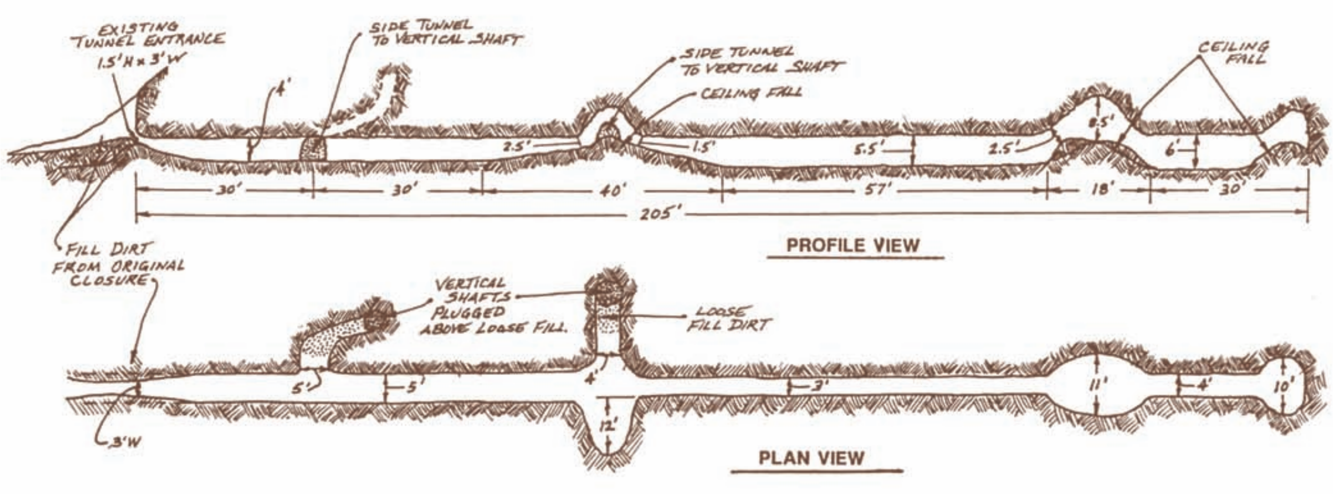


Figure 5. Collapsed tunnels and narrow openings are two potential hazards of studying mining sites. Blankets Creek Gold Mine (Site 9CK465), Cherokee County (Source: Allatoona Lake Managers Office 1996).

blasting devices or materials found at a site should be considered highly dangerous, regardless of how old. In addition, ponds located at mining sites might be flooded shafts or old leaching pits containing dangerous chemicals. As with other low spots, care should be taken around ponds because the ground can be unstable. Mine sites might also contain hazardous materials such as mercury, cyanide, and arsenic, which were used for certain processes. They may be present in the ground or in unmarked containers (Noble and Spude 1992:6; CALTRANS 2008:177). Historical documentation can provide information on the types of procedures that took place at a mine site, which in turn can suggest if certain hazardous materials were used there. If excavation will be undertaken, then a hazardous materials assessment should be performed.

Historic architecture found on mining sites should be photographed and recorded per Georgia standards. Examples of historic mining property types, including structures, are provided in Chapter VI, but it is important that the surveyors recognize and record all of the features of mining structures, with an emphasis on interior processing equipment and machinery. Surveyors should be cognizant for the presence of bolts or other fasteners in the structure's floor that could indicate the location of equipment that was salvaged and removed after the mine's closure. Historians should recognize that mining companies moved from place to place as the deposits were exhausted in one location and new locations were sought, and hence the removal/relocation of equipment is part of the history of mining in the state, and not necessarily an adverse effect on integrity. Nevertheless, while a site can be significant while missing certain components, it must still illustrate the overall system and procedures employed for mineral extraction and processing that took place there.

The scale of mining properties, the variety of resources they contain, and their setting in cultural landscapes all mandate the use of Geographic Information Systems (GIS) to record, map, and interpret their remains. Property locations should be recorded by GPS including property type in the data dictionary field. Locations should include each property's boundaries. GIS overlays should be developed, including property limits/boundaries as identified through archival research, historic maps or plats showing structure locations, historic aerial photographs, LIDAR data, and other resources, as available.

RECORDING

Procedures for recording mine sites overlap those of survey but call for greater detail and consideration of how the various structures, features, and deposits relate to historic contexts and convey historic significance. After the initial Phase I survey identified mining features at Humbug Creek in Arizona, for example, researchers from Dames & Moore returned and intensively resurveyed the site to record it (Ayres et al. 1992). Although Phase I survey for mining sites involves considerable archival research, the recordation phase might include additional documentary study combined with fieldwork.

Historical research completed for site identification generally focuses on modeling locations and content. Supplemental research at the recording stage is intended to contribute more detailed information about what activities took place at a particular site as well as providing information necessary for establishing a site's period(s) of historic significance and what historic contexts it might relate to. Chain-of-title research should be conducted to determine the property's ownership and the mining businesses that were its owners. Secondary sources are also useful documents if they describe particular sites (CALTRANS 2008:156).

Fieldwork at this stage should include more detailed recording methods, including photography, preparation of architectural plans and elevations (if structures are present), sketches of machinery and other objects, narrative descriptions, and preparation of scaled maps (Noble and Spude 1992:9). Detailed fieldwork, mapping, and recording at this stage are particularly important in establishing the content of a site and its boundaries. Mining sites may be recorded as either a set of sites within a complex or district, or a series of features within a site. The determination as to which of these options is appropriate depends on the size of the resource, its complexity, and its associations, chronology, and the types of features and elements involved (CALTRANS 2008:157).

Evaluation fieldwork should also emphasize collecting information necessary to assess integrity and significance and should employ methods appropriate for making these determinations. The total site, including both structures and archaeological materials, must be assessed to determine how well it conveys a sense of time, place, and historical patterns or themes, as well as how well it might address important research questions (Noble and Spude 1992:9). Detailed recording will help with this by providing the information necessary to identify individual features and interpret how they related historically. As discussed, however, there are problems in recording and evaluating subterranean features of a mine site. Remote sensing or probing might help identify the presence of underground components but the safety issues inherent in dealing with them cannot be overcome without specialized assistance.

Finally, the physical remains of the site must be analyzed to link them to the mine during its period(s) of operation and to the social and economic systems in which it functioned. The analysis and interpretation can be complicated by the actual life cycle of the mine. Mines may be abandoned and then re-opened at a later time, or new technologies and processes can be applied, which can damage or destroy older features and deposits. Mine sites may therefore include features and objects from more than one time period, and it is important to determine the temporal relationships of individual features in order to interpret engineering and other systems (Noble and Spude 1992:9).

The use of a geodatabase is encouraged at this stage. A geospatial database (geodatabase) consists of a GIS with an associated database in Access or similar software. The database should contain feature descriptions, functions, ages, and images. González-Tenant illustrated the use of GIS and geodatabases to map and interpret mining sites in the Otago Goldfields of New Zealand (González-Tenant 2009), and his study showed the utility of this approach in mapping resources by function, age, and landscape. Preparation of geodatabase would include detailed recording of mining property types with GPS, preparing descriptive analyses of each property as well as its age of construction for use in mapping and displaying mining landscapes over time, georeferencing historic maps of the mining site, overlaying the site map on the map mineral resources to determine which resource the mining property is associated with, and comparing the spatial distribution of the site with other recorded mining properties. Use of geodatabase analysis will facilitate the evaluation of several aspects of integrity, including location, setting, and design, as discussed in Chapter VII.

The mitigation of historic mining sites, when required, will vary based on the nature of the resource and its components. Appendix 4 contains an archaeological research design for historic mining and outlines research topics and questions that may be used in developing data recovery plans and agreements for archaeological data recovery of historic mining properties. Archaeological methods at this stage may include hand-excavated test units to recover artifact samples from domestic components; a combination of hand or machine excavation to expose and record mill and processing architecture and equipment; slot trenching to record the original contours and techniques used in trenches, pits, and cuts; and detailed mapping and photography to record and document the mine's organization and development over time, if possible. Depending on the time of year, brush clearing and leaf blowing may be required to remove surface obstructions from the historic mine landscape in order to accurately and completely map and record all mine features. Additional historical research should also be conducted to determine the ownership history and personal and business profiles of individuals and businesses associated with a mine, as well as to identify related sites. Large format archival photography per the standards of the Historic American Buildings Survey/Historic American Engineering Record/Historic American Landscape Survey (HABS/HAER/HALS) or an equivalent may be needed to document landscape features and historic structures. Finally, pubic outreach opportunities should be assessed to inform the public of the mine and its history and significance.

III. Economic Minerals in North Georgia

This assessment of mineral resources covers the geologic provinces of north Georgia – the Valley and Ridge (which includes the Appalachian Plateau), Blue Ridge, and Piedmont. Similar rock types are found within each province and provide a convenient way to group mineral resources.

Sedimentary rocks of Paleozoic age comprise the Valley and Ridge Province, located in a small portion of the state's northwestern corner. The province consists of folded and faulted Paleozoic sediments forming northwest-to-southeast running ridges and valleys, which give the province its name. Thrust faults are comprised of overlapping sheets of limestone, sandstone, and shale. Carbonate units include Knox dolostone and Chickamauga limestone in karst and cave formations across much of the region across the north. Chert silicates, known as Ridge and Valley chert, are found in the northwest corner of the state. Mineral resources from this region include limestone, dolomite, and coal (University of Georgia Department of Geology n.d.).

The remainder of the study area includes the Blue Ridge and Piedmont Provinces, which are characterized by igneous and metamorphic (crystalline) rock types. These provinces are bounded by thrust faults, and consist of highly metamorphosed bedrock, commonly gneisses and schists, trending northeast to southwest. Metamorphic rocks of the Blue Ridge include metamorphosed crystalline rocks extend to the fall line that also trends northeast southwest between Augusta and Columbus, Georgia. For this study, the fall line corresponds to the southern boundary of the study area or the contact between crystalline rocks and lithologies of the Gulf Coastal Plain Geologic Province.

The Blue Ridge is composed of metamorphosed rocks equivalent of Paleozoic sedimentary rocks as well as metamorphosed igneous rocks, such as Corbin Metagranite, Fort Mountain Gneiss, mafic and ultramafic rocks, and the metavolcanic rocks in the Gold Belt. Gold was one of the most sought mineral resources of the Blue Ridge, but other resources that were mined include marble and talc (University of Georgia Department of Geology n.d.).

The Piedmont is also composed of metamorphic rocks such as schists, amphibolites, gneisses and igneous rocks such as granite. Isolated granite plutons, such as Stone Mountain, are found in the Piedmont. Mineral resources of the province include granite, which was extensively mined in the Stone Mountain and Elberton vicinities; soapstone, which is found in outcrops on Soapstone Ridge in DeKalb County; and kyanite. The soils of the region also produced kaolin, which was mined for use in ceramics and other applications (University of Georgia Department of Geology n.d.).

To identify the mineral resources located within the geologic provinces, state and federal geologic survey information was collected and reviewed. As recommended in the National Park Service's (NPS) National Register Bulletin Guidelines for Identifying, Evaluating, and Registering Historic Mining Properties (Noble and Spude 1992), preliminary research focused on the Georgia State Geological Survey publications, which provided the majority of the mineral resource information. The United States Geologic Survey (USGS) Geographic Names Information System (GNIS) was queried for locations, names, and other attributes of mine sites.

In addition, digital geo-spatial datasets containing the state geologic map and attribute data from USGS Open-File Report 2005-1323. Preliminary integrated geologic map databases for the United States (Alabama, Florida, Georgia, Mississippi, North Carolina, and South Carolina) were used to obtain the geologic association of mineral resources by geologic province and for surrounding geologic descriptions/formations for the GNIS mines.

These sources provided data at a regional scale (1:500,000) and indicated generalized occurrences of mineral resources, mines, and prospects in north Georgia. Site-specific locations of individual deposits are more accurately ascertained through local level investigations (i.e. 1:24,000), which are beyond the scope of this study.

The research revealed nearly 40 rock and mineral resources in the study area. Table 1 includes a brief description of these resources along with their common uses. Appendix 1 includes tables of the mineral resources, prospects/mines, and geologic description/formation, which are sorted by county. GNIS data is also included in these tables. While the GNIS information is location specific and believed to be accurate at a scale of 1:24,000, this database did not provide data regarding mining activity. However, the spatial location of these mines, together with their proximity to identified mineral resources and the geologic description/formations, in some instances, allow for generalized conclusions regarding mining activity within each county of the study area.

Table 1: North Georgia Rock and Mineral Descriptions and Uses

Type	Description	Use
Asbestos	A fibrous magnesium-iron silicate that is found in the crystalline rock areas and has been mined in White, Habersham, Rabun, Barrow, and Meriwether counties.	Insulation, chemical filters, plastics, fireproof materials.
Barite (Barium Sulphate)	Found in Bartow, Floyd, Cherokee, Gordon, Murray, and Whitfield counties and mined extensively in the Cartersville district of Bartow County.	Well drilling muds, barium chemicals, paint, rubber fillers, glass manufacture.
Beryl (Beryllium Aluminum Silicate)	Found in granitic rocks and pegmatites	Gem stone emerald, a hardening agent in metal alloys particularly with copper.
Bauxite (Aluminum Oxide)	Found in Walker, Chattooga, Gordon, Bartow, Polk, and Floyd counties (Paleozoic sediments); Sumter, Stewart, Macon, Schley, Twiggs, Wilkinson, Baldwin, and Washington counties (Coastal Plain); and Meriwether County (crystalline rocks).	Alum, firebrick, artificial abrasives, aluminum metal products.
Chromite	Chromium, iron oxide, formed in ultra basic igneous rocks.	Increases hardness of steel, plating plumbing fixtures and automobile parts, refractory bricks for metallurgical furnaces.
Coal (Bituminous)	Occurs in Dade, Walker, and Chattooga counties of the Paleozoic sedimentary area.	Fuel
Copper Ores (Chalcopyrite And Bornite)	Have been mined from deposits of pyrite in Fannin, Cherokee, Paulding, and Haralson counties also in Lincoln County; and also occurs in Lumpkin and Fulton counties.	Electrical wire, brass, castings, roofing, coinage, jewelry.

Type	Description	Use
Corundum (Aluminum Oxide)	Found in the crystalline rock area in a northeast trend from Troup County to Rabun County.	Gemstone and abrasive.
Dolostone	A sedimentary magnesium-calcium carbonate rock found primarily in the Paleozoic sediments but also occurs locally in the coastal plain and in the Brevard zone.	Agricultural lime, aggregate.
Feldspar	An aluminum silicate group with various amounts of potash, soda, and lime found in pegmatites and granitic rocks throughout the crystalline rock area; also obtained from crushed granite.	Ground feldspar for glass, pottery, enamels, glazes, scouring powders and soaps.
Flagstone	A hard fine-grained stone (limestone, sandstone, shale, slate, schist) that occurs in thin beds and splits uniformly along bedding planes.	Building and paving stone.
Fuller's Earth (Clay)	Mined in large quantities in two sections of the Coastal Plain, Jefferson and Twiggs Counties and Decatur, Grady, and Thomas counties. Georgia is a top producer of Fuller's Earth.	Bleaching petroleum and edible vegetable and animal oils; insecticide carriers, floor sweeps, soap, medicines, drilling muds, kitty litter.
Gold	Occurs in two major belts in the crystalline rock area. The larger belt begins in Rabun County, continues southwest to Carroll County, and into Alabama; an eastern belt extends through Habersham, Hall, Forsyth, And North Fulton counties; a smaller belt trends west through southern Lincoln, northern McDuffie, and eastern Taliaferro counties.	Jewelry, electrical uses, industrial uses for special equipment in rockets.
Granite And Gneiss	Intrusive and metamorphic rocks composed of feldspar, quartz, mica, and accessory minerals found throughout the crystalline rock area, are important resources of Georgia. Large quarries are operated in the Atlanta and Elberton districts.	Dimension stone for building stone, monumental stone, curbing, paving blocks; crushed stone for concrete aggregate, road material, and chicken grit.
Graphite	Hexagonal carbon mineral formed in some metamorphic rocks.	Manufacture of refractory crucibles, lead pencils, lubricant, paint additive and graphite rods used in nuclear reactors.
Gravel	Loose aggregation of fluvial stones up to several inches in diameter.	Road base and aggregate for construction industry.
Halloysite	Aluminum silicate clay mineral similar to kaolinite, formed through weathering of aluminum silicates particularly feldspar.	Manufacturing of brick, china, pottery, and manufacture of refractory products.
Iron Ore	Brown iron ores (limonite, geothite) occur throughout the state but are mined in Bartow and Polk counties (Paleozoic sediments); also in Dooly and Pulaski counties and in Marion, Quitman, Webster, and Stewart counties (coastal plain). Red fossil iron ore (red hematite) contains fossil seashells and occurs in Dade, Walker, Catoosa, and Chattooga counties (Paleozoic sediments).	Ores of iron, red pigment.

Type	Description	Use
Kaolin (Sedimentary, Hydrous Aluminum Silicate)	Occurs primarily in those counties in the extreme northern Coastal Plain and is mined almost entirely within the Coastal Plain in Twiggs, Wilkinson, Washington, McDuffie, Richmond, and Glascock counties. Also, Georgia is the leading producer in the United States. (Primary kaolin is found in the crystalline rock area.)	Soft kaolin for coating and filler for high-grade white paper, filler for paints and plastics, filler in rubber, base for white porcelain ware; hard refractory kaolin for firebrick, mortar, cement. Kaolin may be used for the manufacture of aluminum.
Kyanite	An aluminum silicate that is mined at graves mountain in Lincoln County and was mined in Habersham County; also known to occur in Rabun, Dawson, Pickens, Cherokee, and Upson counties.	Refractory and other ceramic products, glass tank blocks, also a gemstone.
Limestone (Calcium Carbonate)	Occurs in a hard form in the Paleozoic sedimentary area and in a soft to medium-hard form in the Coastal Plain.	Aggregate for concrete and highway construction, Portland cement, agricultural lime.
Manganese Ores (Pyrolusite, Psilomelane, Etc.)	Occur in the Paleozoic sedimentary and crystalline rock areas and are mined in the Cartersville District.	Manganese steel, ferroalloys, dry cell batteries, lavender tint for glass; manufacture of chlorine, oxygen, etc.
Marble (Recrystallized Calcium Carbonate)	Quarried in Pickens and Gilmer counties. The beauty and variety of Georgia marble is well known.	Dimension stone for buildings, monuments, interior decorations, and statuary; and crushed stone for terrazzo, stucco, lime, and mineral filler.
Muscovite Mica (Hydrated Potassium Aluminum Silicate)	The colorless or transparent commercial variety of mica. In small flakes, it is found in every county of the crystalline rock area. Sheet mica has been mined or prospected in 31 counties of this region. In recent years most of our sheet mica has been produced from Upson, Lamar, Monroe, Cherokee, Pickens, Lumpkin, Union, Rabun, Hart, and Elbert counties. Mica for grinding of smaller size is mined in Hart County.	Sheet mica for electrical uses; ground mica for roofing materials, joint cement, well drilling compounds, rubber, paint, wallpaper.
Ocher	Very fine powdery variety of hematite (red) or limonite (yellow)] mined east of Cartersville near the Etowah River in the Paleozoic sedimentary area.	Pigment for paints and mortars, filler in linoleum.
Olivine	Calcium, magnesium, iron silicate formed in magma of igneous rocks at high temperatures.	Refractory sand and was reportedly used in the manufacturing of the exterior tiles of the U.S. space shuttle fleet.
Pyrite (Iron Di-Sulphide)	May be found in minute quantities over the entire state, but particularly good deposits exist in a belt covered by Carroll, Paulding, Haralson, Cobb, Cherokee, Dawson, Lumpkin, White, and Towns counties.	Sulfuric acid, iron sinter, source of sulfur.
Quartzite	A metamorphic rock consisting essentially of quartz found throughout the crystalline rock area.	Road material, aggregate, industrial sand.
Sand And Gravel	Occurs over most of the state. Extensive deposits are found south of Columbus, Talbot-Taylor County area, south of Gaillard, southeast of Macon, south of Augusta, and in Thomas County.	Sand for structural work, molding purposes; gravel for roofing, road surfacing, high-grade sands for the production of glass are found principally in the coastal plain.

Type	Description	Use
Sandstone	A sedimentary rock consisting principally of quartz) common in the Paleozoic sedimentary area and coastal plain.	Building stone, road material.
Shale	A consolidated sedimentary clay mined extensively in the Paleozoic sedimentary area.	Brick, tile, sewer pipe, road material, lightweight aggregate.
Slate	Fine-grained metamorphic rock that contains slaty cleavage.	Building stone, lightweight aggregate.
Sillimanite	An aluminum silicate that occurs extensively in the crystalline rock area, especially in Hart, Elbert, and Madison counties.	High temperature refractories.
Structural Clays	Are taken from flood plains of streams and large rivers, from under swamp areas, from shale formations of the Paleozoic sedimentary area, and from weathered phyllite from the crystalline rock area. In addition, some kaolins of the coastal plain are used for structural products.	Brick, tile, pottery, lightweight aggregate.
Sulfide Deposits	Mineral compound formed by the linkage of sulfur with metal (e.g. galena PbS, Pyrite FeS2)	Manufacture of sulfuric acid, insecticides, explosives, fertilizers, and preparation of wood for paper manufacturing.
Talc And Soapstone	A magnesium silicate, soft white to green mineral, which grinds to a white lick product; soapstone is impure talc. Talc and soapstone are found throughout the crystalline rock area and are mined in Murray County and from outcrops in southern DeKalb County.	Roofing, filler in rubber, steel marking pencils, paint, carrier for insecticides, refractory articles, cosmetics, paper.
Tripoli (Rottenstone)	Porous friable siliceous sedimentary rock, formed through the weathering of chert or siliceous limestone.	Polishing of metal and stone.
Vermiculite	(a variety of mica) occurs in Rabun, Towns, and other north Georgia counties.	Expanded for insulating material.
Note: Primary source of information in Table 1 from State of Georgia, 1969, Mineral Resource Map of Georgia.		

The study area was divided into a grid of 15 maps (Appendix 2) to show the distribution of mineral resources and the location of mines and prospects. Creation of a digital database containing this information facilitates the categorization and grouping of mineral resources by resource type, distribution, and geologic association at a scale of 1:500,000. The maps in Appendix 2 also depict the strong correlation with structural features, such as major geologic faults, within each geologic province.

The products assembled herein provide a regional overview of the geologic and geographic distribution of mineral resources in north Georgia. It is anticipated that this information may help researchers relate potential historic landscapes, property types, and structures associated with mining activities in the region. Should case studies be undertaken, information such as the GNIS mine names and counties may assist in future location-specific studies.

IV. History of Mining in North Georgia

INTRODUCTION

The search for metallic and mineral ores has been important to almost all human societies since it was first discovered that metals made valuable tools and minerals had a variety of uses. Some metals, like silver and gold, have always been prized for their beauty and quickly became a form of currency that transcended almost all cultural barriers. The search for gold, silver, and other precious metals was an impetus for the exploration of the New World, and the first Europeans to pass through what is now Georgia, the members of the De Soto expedition, were driven by the Spanish empire's search for gold. The failure to find the precious metal in the 1540s doomed the expedition, and Spain only maintained a tenuous hold on any of the lands north of what is now the state of Florida. Years later, beginning in the early 1700s, English-speaking colonists began settling Georgia, starting in the Savannah area and slowly moving inland. It is ironic that De Soto failed to find gold in Georgia, since its discovery near Dahlonega in the early 1800s was the largest find north of Mexico before the discovery of gold in California. It was the first gold rush in the United States, and it initiated the first major round of mining in the State of Georgia. It also sealed the fate of local Indian groups, since the gold was found on Cherokee lands that were quickly flooded by Euro-American prospectors.

The first Georgia gold was discovered in 1829 in the Nacoochee Valley of what is now White County. Recent research suggests that the first gold strikes were made in 1826 near Villa Rica but not reported until 1830 (Hebert 2006), so the 1829 discovery in White County was the first one recorded. Larger deposits were found around Dahlonega in Lumpkin County. The greatest annual amount taken out of the ground occurred in 1843 and was valued at over a half million dollars. The Georgia Gold Rush was already on the decline by the time of the California Gold Rush in the late 1840s and early 1850s but mining for gold in north Georgia led to the discovery of copper in the 1840s. The largest copper finds were in the extensive vein at Ducktown, which extended across the border into Fannin County, Georgia from the extreme southeast corner of Tennessee. Many of the minerals and metal ores that were later exploited in the Georgia mining boom of the late 1800s and early 1900s, were found while prospecting for gold and copper in the 1840s. Iron was another ore that was mined during this period, mainly in the Etowah Valley, and the 1859 Iron Manufacturer's Guide reported that it had "…never been so impressed by any exhibition of ore as by the mines of Etowah District" (Lesley 1859:464).

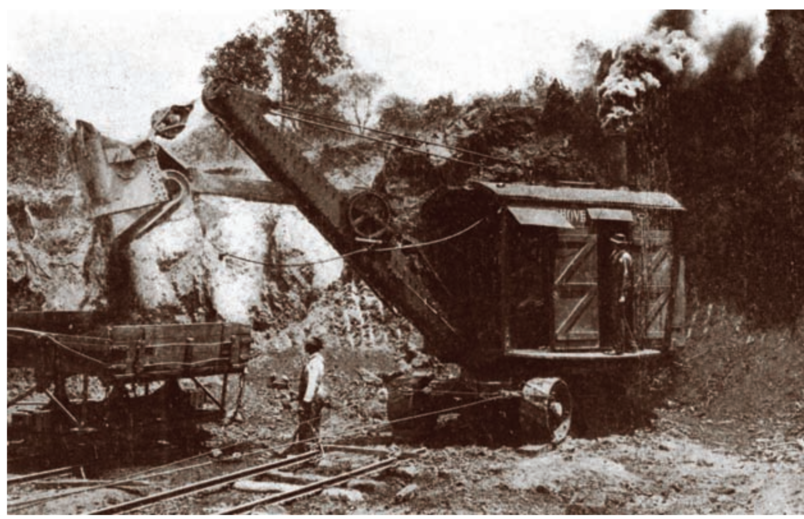
The 1840s and 1850s mining boom was brought to a close by the Civil War, although ore deposits were severely depleted before then. The war itself led to a unique form of mining: the search for saltpeter, or potassium nitrate, an essential component in gunpowder. The best sources for potassium nitrate in north Georgia were the caves where the accumulated remains of bats and other animals could be gathered. Mining for saltpeter was particularly active in Georgia, since one of the main Confederate factories for manufacturing gunpowder was the Augusta Powder Works, located in Augusta (Sneed 2006). Several caves in north Georgia were used for the mining and processing of saltpeter, but the largest operation was at the Kingston Saltpeter Cave in Bartow County. The nitrates of this cave were so valuable that the operation was taken over directly by the Confederate Nitre Bureau. The operation was destroyed by Sherman's troops during the campaign for Atlanta in 1864 (Sneed 2006).

The Civil War led to a spike in mining for saltpeter, but this operation did not survive the war. One of the unintended consequences of the search for saltpeter was an interest in a wide range of both metals and minerals in the hills and plateaus of north Georgia. It is not a coincidence that the zenith of mining in north Georgia began in the years that followed the Civil War.

Beginning after the Civil War, and particularly after 1880, there was an increase in mining in north Georgia, with interest in a far wider range of metals and minerals. Gold, copper, and iron were joined by a veritable catalog of materials: asbestos, barites, bauxite, cement, clays and kaolins, coal, corundum, feldspar, fuller's earth, granites and gneisses, graphite, limestone, manganese, marbles, marls, mica, ocher, precious stones, pyrite, road materials, sand and gravel, serpentine, slate, talc, and soapstone (McCallie 1926:v-vi). By the 1930s, when mining in north Georgia was beginning to taper off, it was noted that more than 35 different rocks, minerals, and metals were either mined or had the potential for mining in Georgia (Furcron et al. 1938:7-8). Competition from new mines in the western states, not a drop in the demand, spelled the end of Georgia's mining era.

The range of materials mined in north Georgia significantly expanded in the years after the Civil War for the basic reason that both the national and world economies in those years were also expanding. It was the heyday of the railroads with demand for coal and iron. In Georgia alone, the total railroad track mileage doubled in the between 1879 and 1894. While rail construction required mineral resources, the construction of rail lines also meant access to a wide range of materials not previously available at reasonable transportation cost (Nesbitt 1896:14). In fact, everything became interrelated: railroads led to greater industrialization and vice versa. The huge advances in commercial electricity, leading to electric lights and motors, added more fuel to the fire. Factories made an increasingly sophisticated array of goods, and chemistry was essential to the process. Minerals that were unimportant before the Civil War were now profitable commodities. Sulphuric acid was the caustic that was essential to industries of the late 1800s, and pyrites were burned to make this chemical. The importance of aluminum for electrical facilities and lightweight motors became so great that the turn of the last century was dubbed the Age of Aluminum. This versatile metal is still in huge demand. This fueled the search for bauxite, the raw material used to make aluminum (Figure 6).

Figure 6. Steam shovel working in an open barite mine. Paga No. 2 Mine, Bartow County (Source Hull 1920).



The apex of north Georgia mining, except for gold and iron, could be said to extend from the 1880s to around 1920, with everything leading up to a crescendo of production during World War I (1914-1918). In the years that followed the war, production tapered off, before plummeting during the Great Depression of the 1930s (Furcron et al. 1938:8). There was still a demand for minerals and metals but that demand was increasingly met with mining from the western states, which had larger deposits and increasingly better rail service (Cave 1922a:70).

The golden age of north Georgia mining has been documented in an extensive series of bulletins published by the now defunct Geological Survey of Georgia. The first Geological Survey was established briefly in the 1870s but was finally put on a permanent footing in 1889 with "a bill to revive the office of the State Geologist and provide for geological, mineralogical, and physical survey of the state of Georgia" (Cave 1922a:70). The first State Geologist, Dr. J. W. Spencer, took office in 1890.

In the years that followed, the Georgia Geological Survey published bulletins dealing with specific minerals or metals almost every year. Beginning in 1894, with Bulletin No. 1 on Marble Production to Bulletin No. 38, published in 1921, the Geological Survey of Georgia produced a collection of invaluable data on a wide range of minerals, in each case covering everything from chemical composition of the mineral, to mining techniques, and the location of individual mines. Bulletin No. 39, "Historical Sketch of the Geological Survey of Georgia," summed up the mineral and mining wealth of the state in 1922, at what was already perceived as the end of the golden age of Georgia mining (Cave 1922b:6-10, 37).

Mining did not end in Georgia in the years after 1920. The demand for building and monumental stone continued to drive the quarrying of marble and granite. The production of clay materials, including kaolin, continues as the most economically viable of all mining operations in Georgia. The brick industry has continued to expand due to local demand, and the same is true of crushed stone. There is even the mining of new minerals beginning in the early 1950s, such as beryl, reported from the Foley Mine in Upson County and the Hogg Mine in Troup County. This mining was at least partially sponsored by the Defense Minerals Exploration Administration (DMEA), originally set up to locate the nation's uranium supply at the beginning of the Cold War (Minerals Yearbook 1955:259-260, 1961:297).

THE MINERAL WEALTH OF NORTH GEORGIA

Mineral resources of north Georgia can be grouped into three classes: metals, nonmetals, and mineral fuels. Metals are represented by gold, copper, iron, and other metals that exist as veins in various geologic strata in the state. Nonmetals include stones, sand and gravel, and other non-metallic mineral properties that were extracted for various uses. Finally, coal and peat were the mineral fuels of the state. The various resources that were mined in north Georgia are discussed below, by class and then alphabetically by type. Tables listing properties recorded in the late nineteenth- and early twentieth-century Georgia Geological Survey reports, by resource type, are provided in Appendix 3.

METALS

Barite

Barite is white metal, which is also known by the commercial name "Barytes". The chemical name for this mineral is barium sulphate, $BaSO4$. Physically, it is a heavy but soft white mineral, usually found in veins within much harder rocks (Hull 1920:1-3). In Georgia, most barite deposits are found in the Cartersville Mining District. Often uneven in size and found in residual clays, barites are also found in association with a number of other minerals, such as pyrite, ocher, brown iron, and manganese ores (Hull 1920:31; Kesler 1950:51).

Barites are essential for many industrial functions. Its primary use is as a filler for paints, pigments, rubber, and cardboard. It is also used to make enamel for paper, metal, and pottery. Barium chemicals are used to make hydrogen peroxide, freestanding oxygen, and serves as a purification agent in many industrial processes. It is even used to fix atmospheric nitrogen for use in fertilizer, or explosives, depending on the need (Hull 1920:5-6). By the 1930s, it was also used as a weighting material in the industrial mud used in drilling oil and gas wells (Furcron et al 1938:14).

The first discovery of barite in Georgia occurred in 1887 in the Cartersville District of Bartow County. The earliest commercial activity is dated to 1894, with the processing of some 60 tons. Yearly output rose slowly in the years that followed, reaching 31,000 tons in 1915. The following year, 1916, saw a huge increase in production, reaching over 100,000 tons, due to the demands of the World War I munitions industry (Cave 1922b:50-51; Kesler 1950:6-7).

Although most came from the Cartersville area, barite was found in a band 75 miles long and around 25 miles wide that extended through Polk, Floyd, Bartow, Cherokee, Gordon, Murray, and Whitfield counties. Only the deposits in the Cartersville District appear to have been commercially viable, however, and the Cartersville District was considered one of the most productive barite-producing regions in the United States, particularly during World War I. It was the only district that was worked by 1926 (McCallie 1926:12-15; Hull 1920:v).

The Georgia Geological Survey Bulletin No. 36, by J. P. D. Hull, "Report on the Baryte Deposits of Georgia," published in 1920, captured the barite industry at its height. At that time, there were dozens of barite mines in the Cartersville District (Hull 1920:44). The bulletin provided maps showing the location of the main barite deposits, as well as a map of the Cartersville Mining District and the locations of individual mines (Hull 1920:18, 21).

In addition to the mines themselves, there were 11 companies that processed the barite yielded by the mines (Hull 1920:41-42). The largest of these appears to have been the Thompson-Weinman Company, with a plant located 1.5 miles southeast of Cartersville, on the Etowah River. Thompson-Weinman owned or leased several different mines and could manufacture 60 tons of white barites every day (Hull 1920:37).

Barite production changed in the 1920s. Just two years after Hull's report, it was noted that only four barite producers were left in Georgia, all in the Cartersville District (Cave 1922b:50-51). By 1950, there were still four barite producers in the Cartersville District: Thompson-Weinman, Chemical Products Corp., Burgess Battery Company, and Ladd Lime and Stone Company (Kesler 1950:7). Barite production was even on the rise in the years that followed, although it was limited to the Cartersville District in Bartow County (Minerals Yearbook 1955:261). The decline in numbers of producers was most likely the result of consolidation by a few large mines rather than a drop in production. Consolidation of this sort was a prominent feature of the Cartersville District (Gray 2003:245).

By the 1950s, the main barite mines, all in the Cartersville District, were the Barium Reduction Mine, Bertha, Big Bertha, Cherokee Barite, Paga No. 1, Paga No. 2, Reservoir Hill, Section House, and Slabhouse mines. With the exception of the Cherokee Barite Mine, all had been initiated during World War I (Kesler 1950:63-67). Not only were the barite mines doing well in the mid-twentieth century, they were by this point in time the main mining activity in the Cartersville District. In 1950, it was estimated that the barite production around Cartersville comprised almost a quarter of the total barite produced in the United States since 1880 (Kesler 1950:6-7).

Barite deposits in the Cartersville District were mined by hand and powered equipment, with mechanical excavators being the norm since at least World War I except for prospecting (Figure 6). Mineral extraction was by open-cut method, sometimes using explosives to open up the hillsides (Hull 1920:34-35). Processing after extraction involved mainly cleaning and concentrating, ideally to achieve at least 90 percent purity, or it ran the risk of rejection by the manufacturers (Hull 1920:36-37). In Georgia, concentrating barites involved mainly washing and jigging to separate the valuable mineral from the waste (Figure 7).

Figure 7. From the mine, barite ore went to a washing plant to be concentrated for market. Plant and mud pond, Paga No. 1 Mine, Bartow County (Source: Hull 1920).

Bauxite

Bauxite, usually identified chemically as dihydrate of alumina (Al2O3) or some similar formulation, was first discovered by French chemist Pierre Berthier in 1821 in Baux, France. Named for the place where it was discovered, bauxite was at first only known from deposits in Europe. Its discovery in 1887 near Rome in Floyd County, Georgia, was the first in the United States (Watson 1904:13-25, 41).

Bauxite, which is the ore from which aluminum is normally made, went from a curiosity to an essential ingredient of the Industrial Revolution by the late 1800s and early 1900s. Aluminum, which is lightweight and highly versatile, quickly became popular for a number of different applications. Some of the more traditional uses of aluminum metal included castings for iron and steel, and lightweight but durable objects that ranged from canteens to power boats (Watson 1904:133, 138). In the years that followed, aluminum became indispensable in the manufacture of airplanes and airplane motors. In addition to traditional methods of smelting, aluminum could be worked by electrical processes that were first patented in the late 1880s (Watson 1904:135-138). Ironically, only a relatively small portion of Georgia bauxite was ever used to make aluminum metal; most was used for the manufacture of alum, created when bauxite ore was treated with sulfuric acid (Watson 1904:146-148; McCallie 1926:22-23).

The first bauxite deposits were found in Georgia in 1887 a few miles northeast of Rome, near Hermitage in Floyd County. They were found on the James Holland Property, Land Lot 61 in the 23rd District. The mine was opened in April of 1888. In 1889, the first year of production, 728 tons were shipped to Natrona, Pennsylvania. At the time, this was the entire bauxite production in the country (Watson 1904:25; Cave 1922b:51-52).

By the mid-1890s, there were two large bauxite operations in the Floyd and Bartow County areas. The first was Republic Mining and Manufacturing Company, which ran the Hermitage furnace five miles north of Rome. The second was the Georgia Bauxite and Mining Company, with its Comosema and Barnsley mines near Adairsville in Bartow County. At the time, these represented the largest bauxite deposits known in the United States (Nesbitt 1896:60-62).

Bauxite deposits were soon found in other areas of northwest Georgia, leading to the identification of a "bauxite belt" in the Coosa Valley, from Gordon and Walker counties southwest some 60 miles to the Alabama border. Within a few years, the bauxite belt included deposits in Walker, Chattooga, Gordon, Bartow, Polk, and Floyd counties, all located in the northwest corner of the state. The vast majority of the mines in this belt were located in the Hermitage District of Floyd and Bartow counties, and the Cave Spring District and Bobo District of Floyd County (McCallie 1926:15) (Figure 8).

A second bauxite belt was discovered in Georgia just below the Fall Line in the years after 1907. Beginning with discoveries in Wilkinson County, this second belt was soon expanded to include Sumter, Stewart, Macon, Schley, Twiggs, Baldwin, and Washington counties. By 1938, the deposits were exhausted in the first bauxite belt in northwest Georgia, but mining in the second belt was still viable (Cave 1922b:51-52; Furcron et al. 1938:14-16).

Thomas Watson (1904) described the mining techniques employed in the first bauxite belt (northwest Georgia) around the turn of the twentieth century. At that time, bauxite mining was not particularly sophisticated, largely due to the nature of the deposits themselves. Most bauxite ore in

Figure 8. Bauxite was a significant post-Civil War mineral industry in Georgia. The Gulliver Bauxite Plant, Walker County (Source: Watson 1904).

Figure 9. Bauxite Mining in Georgia was typically conducted in open pits using simple equipment. The Watters Bauxite Mine, Floyd County (Source: Watson 1904).

this part of the state was found in disconnected fragments on the tops or sides of limestone ridges and in the adjacent valleys. Two main considerations for mining were the amount of bauxite ore present in the soil or rock matrix, and the purity of the ore itself. Usually mining was done in open pits or cuts, although some underground work was conducted where the ore had a high concentration (Figure 9). Typically, once out of the ground, the ore was cleaned of adhering clay and dried before shipping (Watson 1904:150-153).

By the 1920s, the first bauxite belt was being played out and production had mostly shifted to the Coastal Plain. The Georgia bauxite industry began a decline in the 1930s, however, having been out-competed by higher-grade ores in other states (Furcron et al. 1938:9). By 1952, the only remaining producer in the state was the American Cyanamid Company, with mines in Macon, Sumter, and Bartow counties and a processing plant in at Halls Station in Bartow County (Minerals Yearbook 1955:260).

Copper

Copper has always been a highly prized metal, and in Georgia, only gold was mined earlier and with more effort and investment. The history of copper goes back to the early days of civilization, when it was discovered that the metal, combined with tin, could make bronze, which was harder and more useful than either of its components. Due to its remarkable conductivity, copper was also prized as wire for the transmission of electrical current. With the invention of the telegraph, telephone, and finally the vast expansion of the electrical commercial industry in the late nineteenth century, the demand for copper increased exponentially. By the early 1900s, the electrical industry absorbed at least half of all mined copper. The rest went for brass and castings, sheet copper for roofing, and coins (McCallie 1926:44; Furcron et al. 1938:31).

Most copper found in Georgia is located in the extreme north central part of the state and is associated with the massive Ducktown deposits found in the southeast corner of Tennessee. As a result, most Georgia copper mining was at the

Tennessee border (Nesbitt 1896:60, 67). Ducktown copper, discovered around 1840, was for a while the most important copper deposit in the United States. By the 1850s, Ducktown had two blast furnaces. During this period, there was a lot of prospecting for additional copper deposits south of Fannin County, and many mineral mines that became useful in the years after the Civil War, were first discovered in this early search for copper (McCallie 1926:43-44). Even though no major copper deposits were found south of the Ducktown deposits, Ducktown itself continued to be profitable. During the Civil War, only the Federal occupation of southeast Tennessee was able to disrupt this operation (Stevens 1903:116).

Copper mining at Ducktown was further disrupted by lawsuits in the years after the Civil War, but it soon became clear that the best deposits in the area were already played out. At the peak of Ducktown mining activity, there were copper mines in at least three Georgia counties. Two were in Fannin: Mobile Mine and a mine known simply as "Lot 20." Cherokee County had the Canton Copper Mine; and Haralson County had the Waldrop Copper Mine, which began as a copper mine and soon switched to pyrites. One source claims that these were the only actual operating copper mines in Georgia (McCallie 1926:42). According to another source, by 1903, it was known that there were copper deposits in Lincoln and Rabun counties in addition to Fannin, but at that time, there was only one active copper mine in the state: the Magruder Mine, owned by Seminole Copper Company. It was noted, however, that plans were underway to re-open the Canton Mine (Stevens 1903:103-104). The Magruder Mine appears to have been a small operation for the recovery of blister copper, a by-product of the Seminole gold mine in Lincoln County (McCallie 1926:44).

The two mines in Fannin were by far the oldest of the four. Mobile Mine was active in the 1860s but little more is known about this mine than that. "Lot 20" began operation in 1861 under a lease by James Phillips, but work was later halted by the Civil War. Even though work resumed in 1866, the operation was soon embroiled in a lawsuit, and the mine never regained its momentum. The mine was put back in operation during World War I but closed soon after. By the 1920s and 1930s, copper was no longer mined in Georgia (Cave 1922b:55; Furcron et al. 1938:30-31).

Gold

The Georgia gold rush took place in a region reserved by treaty as Cherokee Territory, and the discovery of gold here had severe consequences for the local aboriginal population. By the early 1800s, after a series of land concessions, the Cherokee population of the region was concentrated in the northwestern part of Georgia and adjacent parts of neighboring states. With a series of land cessions through the 1810s and 1820s, Georgia managed to push the Creek Nations out of the western part of the state, while at this same time beginning to pressure the Cherokees to move too. A treaty in 1819 fixed the boundary of the Cherokee territory at the Chattahoochee River. In 1823, Georgia prodded the Federal government into trying to negotiate further relocation treaties. After protracted negotiations with the Cherokee produced no further land cessions, in 1828, the Georgia Assembly finally took action and extended the laws of the state over the region. As far as the State of Georgia was concerned, the Cherokee Nation ceased to exist (Coleman et al. 1977; Williams 1993:18).

Figure 10. The discovery of gold in Georgia attracted thousands of miners and profoundly impacted resident Native Americans and the land. Placer mining on Coosa Creek, Union County (Source: Yeats et al. 1896).

While the process of taking the Cherokee lands was moving forward, the first gold discoveries were made in Georgia. The first documented discovery was reported in the August 1, 1829 edition of the Georgia Journal (Crane 1908:71; Greene 1935; Williams 1993:24). Anecdotal accounts suggest earlier discoveries, and Fletcher Greene (1935:7) suspected that prospectors drifting down from North Carolina, where gold had been found around 1800, were making strikes in Georgia that went unreported. The 1829 report is the first undisputed account of gold in Georgia, however, and its discovery triggered events that transformed the Cherokee territory.

By the autumn of 1829, the gold rush was underway, possibly involving thousands of miners. By June of 1830, 4,000 miners were working on Yahoola Creek, near present Dahlonega, while as many as 7,000 were in Habersham County and about 3,000 were in Hall County (Greene 1935:8; Williams 1993:25) (Figure 10).

Despite Cherokees still occupying the land, in 1831, the General Assembly assembled teams of surveyors and sent them into northwest Georgia to begin the process of dividing the territory into sections, districts, and 160-acre parcels that would be sold off in a state-wide lottery scheduled to begin in 1832. In addition to spurring the settlement of northwest Georgia, the discovery of gold influenced how settlement occurred. The surveyors were responsible for designating and plotting areas containing gold, which would be separated into 40-acre lots (Williams 1993:47). Ultimately, white settlement of former Cherokee territory was densest in these districts, reflecting a gold rush settlement pattern rather than one based on agricultural land or other resources (Wishart et al. 2006:32-35).

Efforts to remove the Cherokee continued through the 1830s. In May of 1830, President Jackson signed the Indian Removal Act, providing for the forcible ejection of Natives from land they occupied. Disregarding an 1832 Supreme Court ruling in Worchester v. Georgia that nullified the application of Georgia law to Cherokee territory, the state went ahead with the land lottery. To most Cherokees, the state's indifference to the Supreme Court ruling and President Jackson's refusal to enforce it meant the end of any hope of retaining land in Georgia. The influx of tens of thousands of whites only reinforced the feeling. Finally, in 1835, a faction of Cherokees took payment and promises of land elsewhere in exchange for signing away claims to Georgia land at the Treaty of New Echota. Although not all Cherokees signed on to this treaty, it formed the basis for their forcible removal by the U.S. Army in 1838 (Coleman et al. 1977; Williams 1993).

The gold rush significantly influenced the development of northwest Georgia in other ways beyond the forced expulsion of the Cherokee. As noted, the region was divided in ways that reflected the presence of gold. Gold also affected land holding patterns. Devised as a response to earlier land frauds, the lottery was supposed to open distribution to a wider cross section of the state's (white) citizens and reduce speculation (Coleman et al. 1977:107; Williams 1993). Speculation still took place, however. The location of the richest or most promising gold lots were generally known and mining companies formed to buy them from lottery winners (Williams 1993:52). The mining interests brought a different kind of focus and activity to the region than land speculators would have.

Additional effects of the gold rush included dramatic increases in trade and commerce, newly prosperous towns at the edge of the Cherokee frontier, and the creation of boomtowns in the gold region of present-day White, Lumpkin, and Dawson counties (Williams 1993:56-57). The first boomtown was Auraria in Lumpkin County. Originally a small settlement centered around a tavern, the community of Nuckollsville suddenly grew into a town of over 100 houses, about 20 shops, 15 law offices, several taverns, and a population of about 1,000 people, with an additional 10,000 people in the surrounding countryside. With the rise in prosperity, people wanted a more "respectable" name, and settled on Auraria from the Latin aurum (gold) (Coulter 1956:16-17; Williams 1993:58-59). As miners began focusing on other locations, new settlements appeared. One, located about five miles away on Cane Creek, experienced the same kind of rapid development that took place in Auraria. In 1833, judges of the Inferior Court selected the Cane Creek settlement as the county seat. This newer settlement received the name Dahlonega from the Cherokee word dalanigei (yellow money or gold), and it rapidly overshadowed Auraria, as businesses, banks, lawyers, and residents relocated there along with the county sheriff and Superior Court clerk (Coulter 1956:95-96; Williams 1993:60-61).

Other towns that emerged or expanded as a result of the gold rush included Villa Rica (Spanish for "City of Riches" but originally Hixville) in Carroll County at the southwestern edge of the Cherokee territory. The town boomed after reports of the discovery of gold at Pine Mountain in 1830; gold may have been discovered here as early as 1826 (Hebert 2006). Clarkesville, in Habersham County, also grew dramatically. In Hall County, the gold rush quickly turned Gainesville, along the Cherokee frontier, into a commercial center, supply node, and gateway to the gold region. In 1831, new streets were laid out to accommodate the town's growth. Finally, a settlement called Etowah, later Canton, became the

Cherokee County seat as well as a hub of commerce and supply for the surrounding mining district (Green 1935:16-18; Williams 1993:63-64).

Some mines during the gold rush era were owned or leased by corporations (Greene 1935:29). At this time, mining companies were usually organized by small local groups of wealthy individuals, although northern financial institutions and foreign investors also participated. Even at this early stage of the mining industry in Georgia, these corporations were serious and formal. The Chestatee Mining Company, established in 1835, illustrates this point. The state legislature authorized the company to distribute up to $100,000 in public stock and draw up a constitution. Stockholders elected the company directors annually, the election being supervised by two justices of the peace who were not stockholders. The sitting directors of the company convened regular meetings, the times of which were made public by notices placed in area newspapers. The presence of these corporations gave rise to subsidiary businesses as well. For example, agents specializing in soliciting investors for mining operations proliferated (Williams 1993:75, 77).

With more money and greater ability to organize labor and technology, mining companies were able to exploit gold lots on a much larger scale than individual miners. The Pigeon Roost Mining Company, for example, had extensive holdings in the 1830s, including four of the richest 40-acre gold lots in Lumpkin County. Additionally, the firm of Ware and Matthews, also in Lumpkin County, dug a shaft mine 100 feet deep in 1834 and processed the ore with a small stamp mill (Coulter 1956:13).

A final development of the Georgia gold rush was the establishment of a branch of the Federal mint in Dahlonega. Once the miners collected the gold from the mine, they could use it as a direct medium of exchange or sell it to storekeepers in local settlements. This practice had its problems, however, as there were often disputes about the value of the gold being exchanged. As an alternative, miners could send gold to the federal mint in Philadelphia or the branch banks in Charleston and Savannah. At the mint, the treasurer issued a certificate testifying to the gold's value and stating the amount in gold coin to be paid for it. The miner could then use the certificate to receive raw gold or wait for his gold to be minted. Aside from the inconvenience of waiting several months for the gold to be minted, traveling to Philadelphia with raw gold took considerable time and exposed the miner to possible robbery. Another option consisted of local private mints, but these could be unreliable or simply incorrect in establishing the value of the gold being minted (Williams 1993:80, 105).

Owing to the problems in delivering gold to Philadelphia and the unreliability of local private mints, proposals were made for a branch of the Federal mint to be placed in Georgia. Efforts to establish a mint began as early as 1831 and eventually in 1835, Congress approved the Mint Act, which called for establishing a branch in Dahlonega, along with two others in Charlotte, North Carolina and New Orleans, Louisiana. The site of the new mint was selected that same year, and it was declared officially open in 1838. The mint remained open until 1861, handling steadily lower amounts of gold over the years. Congress had been trying to close it since the 1840s because its operating costs were higher than its production warranted. After the Civil War, Federal soldiers occupied the building until 1869. Afterwards, the Treasury Department tried to sell the property but could not get a reasonable offer for it. Finally, in 1871, Congress transferred it to the Trustees of the North Georgia Agricultural

College, which opened in 1873. An 1879 fire burned the original building to the foundations, and it was replaced with a new structure, now Price Memorial Hall of North Georgia College (Coulter 1956:14; Williams 1993:106-107, 117, 120-121).

The chief factors that brought about the end of the gold rush era in Georgia included the exhaustion of the placer deposits and the 1848 gold strikes in California, which led to the 1849 gold rush and caused a massive out-migration of Georgia miners. However, profits had been declining steadily for years, and by the 1840s, most mining in the region was conducted at a small scale (Williams 1993:117). From this point through the 1850s, gold mining in Georgia continued with the application of new technology but continued to decline in economic significance.

The exhaustion of placer deposits led to certain important changes after the Civil War. Placer mining focused on collecting loose gold fragments present in eroded gravel beds. As these became harder to find, miners sought to extract minute gold particles embedded in quartz rock. Quartz was present in the region in primary vein (also called lode or hard rock) deposits as well as “float” rock eroded from the veins and embedded in the residual saprolite of the region. Reaching these deposits through deep surface cuts and underground workings, and then separating gold from the ores required the use of new techniques and equipment, as well as new capital, labor, and working arrangements.

The technology and knowledge for working these sources existed in the gold fields early on, but their use was delayed until local interests amassed enough money for the required infrastructure and equipment. Because individual or small collectives of miners could rarely make the necessary investments, the introduction of new techniques brought about an increase in the number of gold mining companies operating in north Georgia. Although such companies were present almost at the beginning of the gold rush, their intensified activity signaled the shift from placer to lode mining. Greene (1935:32) dated this transition to the mid--1830s, but the practice became more common in the 1840s and eventually became the only means of economically producing gold in the region.

This type of mining also carried considerable financial risks, however. Aside from the greater investments in labor and equipment, lode mining required high profit margins (Williams 1993:71). The nature of the quartz deposits in Georgia made this kind of mining an uncertain venture. Small, irregularly distributed veins separated by broad barren zones characterize the quartz lodes (Wilson 1934:3). Mines were apt to work out quickly or might not produce adequately to return the money put into opening and working them. In addition, encountering the water table was likely to cause the mine’s abandonment (Williams 1993:71).

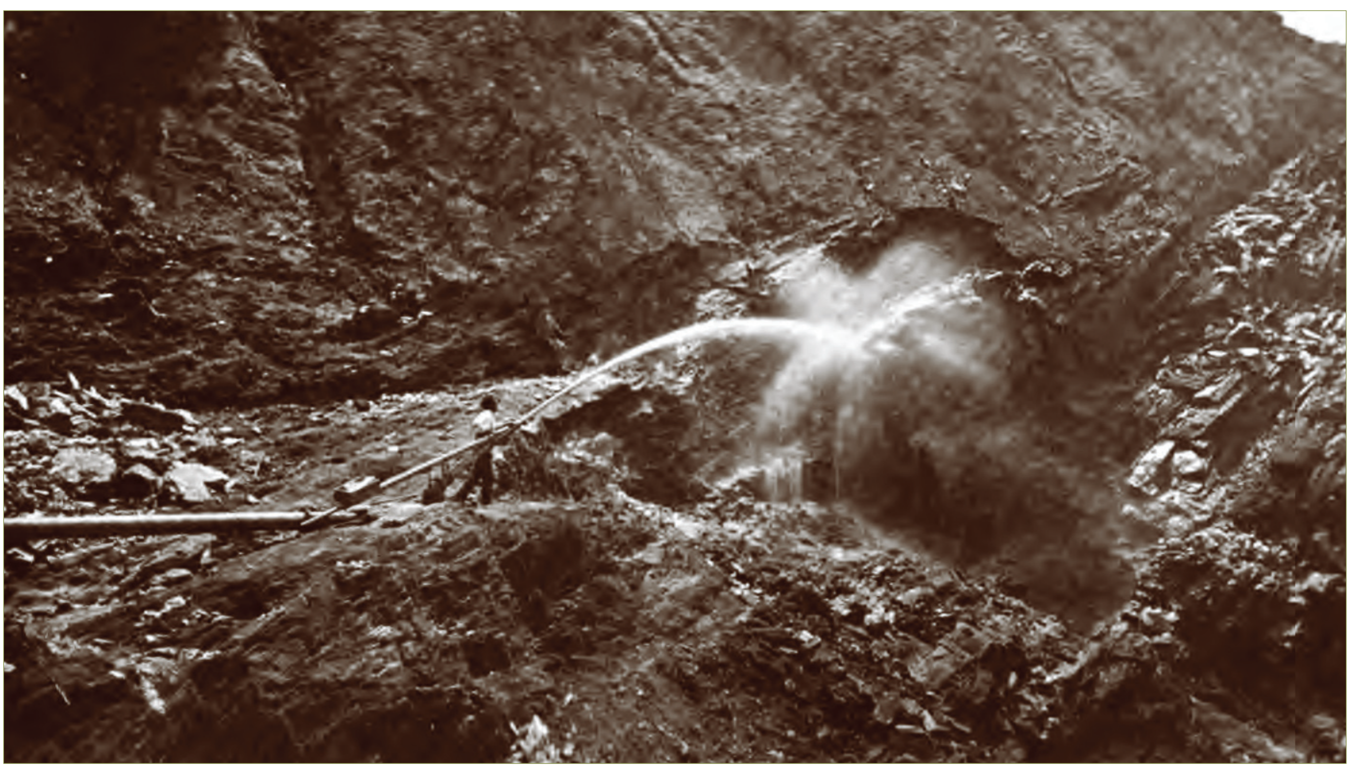
Changes in the gold mining industry also brought about new labor structures, as experienced miners used to working for themselves began having to work for others as placer mining declined (Coulter 1956:13; Williams 1993:70). Hard rock mining entailed mining gold ore in deep cuts or underground shafts and drifts, and then processing it with a variety of mechanical equipment. It therefore also required the participation of skilled engineers and mechanics because of the specialized technologies and methods for extraction and processing.

One of the new mining methods provided an example of the new organization of capital, labor, and materials. Imported from the California gold fields, hydraulic mining focused on extracting gold from the deep saprolite deposits of the region rather than placers along the valley bottoms. Mining took place in deep surface cuts and involved bringing quartz gravel and rock to a stamp mill where it was crushed and the gold extracted through a process of amalgamation (Figure 11). Hydraulic systems and stamp mills required substantial infrastructure to transport and store water, as well as specialized equipment and structures to bring the ore to the mill and remove the gold. Use of this method also necessitated a greater outlay of capital and so was operated under the auspices of corporations rather than individual or small groups of independent miners, while the equipment and techniques required men skilled in handling water and ores and in operating and maintaining the systems necessary to conduct the work.

Vein mining did not have the same kind of excitement or potential for great finds as placer mining. As a consequence, after about 1840, the nature of the gold region changed as mining proceeded at a less frantic pace, drew fewer people, and did not give rise to boomtowns. The period also saw new entries of northern capital and considerable speculation caused by absentee owners who did not understand “southern laborers and their conditions” (Greene 1935:32-33). In general, mining in this period was not profitable and caused severe losses to stockholders in the mining companies.

Gold mining in Georgia came to a halt as the Civil War broke out. The branch mint in Dahlonega closed in 1861. After the war, there was sporadic mining and renewed interest in gold late in the nineteenth century.

Figure 11. Hydraulic mining to expose veins and extract loose ore was introduced from the California goldfields. Singleton Mine, Lumpkin County (Source: Yeates et al. 1896).



After a series of attempts in the post-war years to restart the industry, it was not until late in the nineteenth century that more substantial investments led to the reopening and expansion of mines. Characteristics of this period included the application of new technology, large-scale mining and processing plants, and river-dredging operations on a larger scale than before (Williams 2003). These efforts were not overly successful, however, and by the early 1900s, most mines had ceased operations. Renewed efforts in the 1930s also failed to revive the industry (Rensi and Williams 1988:35). Despite the overall disappointing results Georgia mines continued to yield modest amounts of gold during the first part of the twentieth century as a secondary product of other mineral industries. The last recorded commercial production was in 1953 (U.S. Bureau of Mines 1961, III:303).

By the late nineteenth century, western gold fields, particularly those of California and Colorado dominated gold mining in the United States. Gold mines in the eastern part of the country were clustered in the Appalachian region from Maryland to Alabama, which produced less than one percent of the total value of gold in the entire United States in 1895. In that year, the value of gold produced in Georgia was $127,942, only 0.008 percent of the total generated in the top-producing state, California ($15,334,317) (Yeates et al. 1896:11). At the end of the century it was recognized that the placer deposits of Georgia had been virtually exhausted and mining focused on primary deposits and refractory ores using deep excavation techniques and experimentation with chemical beneficiation methods (Yeats et al. 1896: 25, 32; Jones 1909:18).

The revival of gold mining in the late 1800s apparently rested on overly optimistic reports of the potential of the Georgia gold fields. A 1934 study indicated that there was “no basis to believe that there were rich bodies of gold remaining buried in Georgia” (Wilson 1934:2). Nevertheless, gold mining at the turn of the twentieth century involved significant capital investments in some instances and a few large-scale operations.

One of the largest, and most remarked upon, of the late nineteenth-century operations was the Consolidated Gold Mining Company, established near Dahlonega in 1899. The company’s facilities highlight some of the enlarged and new technologies experimented with during this period. The company built a four-story building measuring 300x100 feet and containing a 120-stamp mill on Yahoola Creek. (By way of comparison, five- to 10-stamp mills were typical in Georgia.) A chlorination plant able to process 50 tons per day was added to the mill and a smaller 10-stamp mill was placed at a second mine upstream on Yahoola Creek. This operation took over several individual mines and expanded the older shafts and tunnels to reach deep veins. Despite these efforts, the company could not make significant profits and by the end of the 1910s, it had been taken over by another company and ceased operations (Jones 1909:197; Williams 1993:121). The consolidated operation therefore also exemplified the unjustified optimism of mine operators at this time.

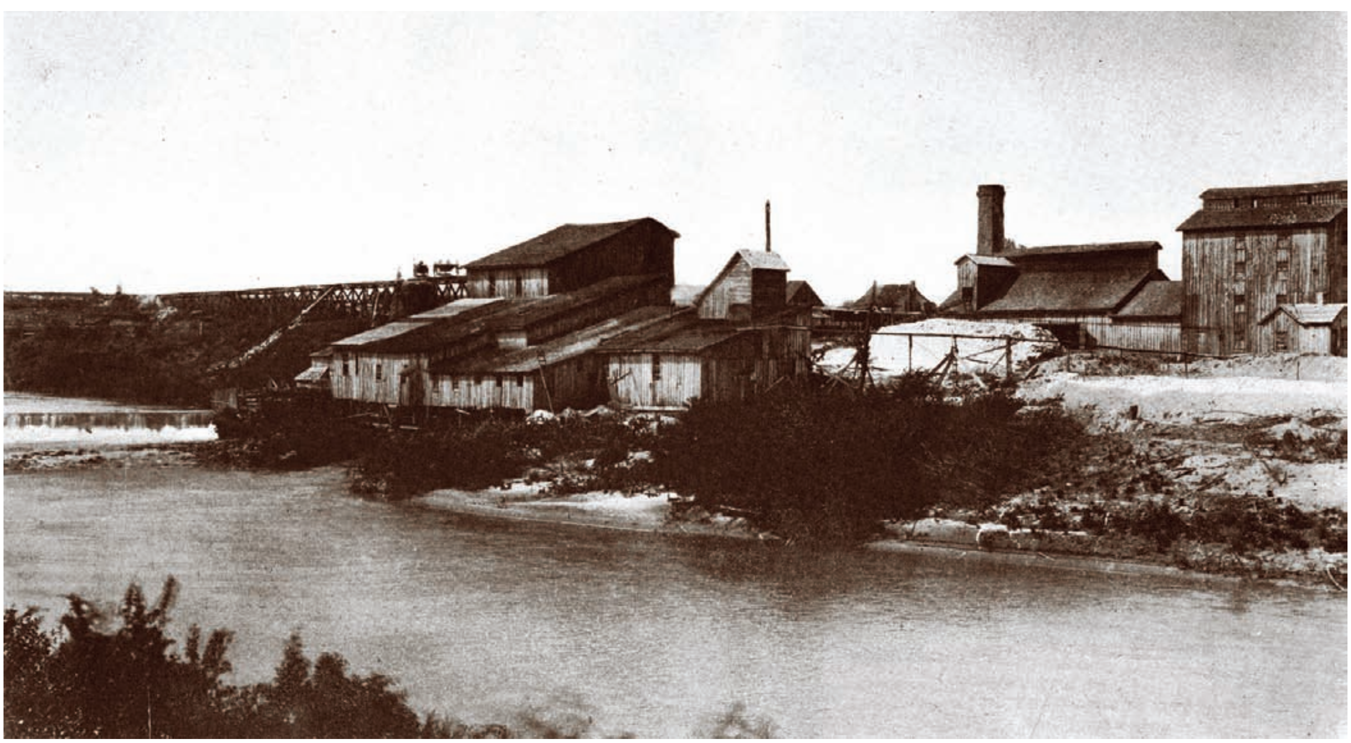
The general lack of profits during the first part of the twentieth century, in fact, was directly blamed on the rush to invest without considering the best approaches for dealing with specific resource types. Jones (1909:14-15) contended that the high incidence of inexperienced mine operators investing in poor locations and building outsized mills or mills that were not equipped to handle the ores properly caused many of the new ventures to fail.

Among the newer techniques employed in gold mining in this period was the use of chlorination to process sulfide-ores. This procedure involved roasting the ores to oxidize the base metal, then saturating them with chlorine gas to convert the gold into soluble chloride of gold, which could be precipitated from the solution with water (Hardesty 2010:79). The process was developed in the mid-nineteenth century but was only introduced to Georgia in the 1890s and was used very little in the state, most notably by the Creighton Mining Company in Cherokee County (Brewer 1896:574; Yeates et al. 1896) (Figure 12). Some mining companies in the eastern U.S. used a process in which cyanide compounds dissolved gold from crushed ore (Hardesty 2010:83-84). This technique was used at a few Georgia gold mines during the first decades of the twentieth century, but it was not especially common (Yeates et al. 1896:177; Paris 2003a; 2003b; Hebert 2006).

In addition to working older mines, some operators put flatboats into the rivers to dredge gold deposits in the streambeds, essentially re-working the placer deposits. This approach had been used during the gold rush period, but with much smaller boats operated by two men, who took the dredged material to shore for panning. Mining companies at the end of the century used larger boats equipped with mechanical dredges that processed the excavated gravels and silts in attached or floating sluices. In all, only about a dozen of these larger boats operated during the last 20 years of the nineteenth century, and they appear to have ceased by around 1900. They were used mostly on the Chestatee River (Brewer 1896:579; Yeates et al. 1896:525-526).

By the early twentieth century, it was understood that earlier methods had been extremely inefficient and wasteful. Some estimates indicated that stamp mills missed as much as 50 percent of the gold embedded in the ore, while hydraulic systems to

Figure 12. A few Georgia gold mining companies used chemical methods to process sulfide ores. Mill and chlorination plant of the Creighton Gold Mine, Cherokee County (McCallie 1926).



mine the saprolite deposits were equally ineffective at removing fine gold particles from the clay (Yeates et al. 1896:317; Wilson 1934:3; Williams 1993:73). Because of this situation, in the 1930s, Wilson (1934:2) asserted that any future mining would have to consider re-working the tailings from earlier mines using modern methods.

Wilson's (1934) point highlights the fact that this last stage of gold mining in Georgia was the most industrialized in terms of organization of capital and labor and the most "scientific" in its approach to new technologies an equipment. Review of Yeates et al.'s (1896) and Jones' (1909) overviews of gold mining in the state indicates that many of the mines at the turn of the century were held by investment and ownership groups from other states, especially in the Northeast and Midwest. Sections of Yeates et al.'s (1896:313-314) study of gold mining in Georgia, in fact, read like a pamphlet designed to attract investment. Yeates et al. also underscore the fact that mining at this time had become a job for paid laborers rather than owner-operators with a stake in the mines' output. Labor was available from local sources, they noted, remarking that ordinary mining hands could be had for eighty cents to one dollar per day, while pay rates for mine superintendents, "who have had long experience in the mines" were about $2.50 per day" (Yeates et al. 1896:314). They further commented, "the ordinary miners are from both the white and negro races; but they work peaceably together; and no strikes, boycotts or collusions of any sort have ever been attempted" (Yeates et al. 1896:314).

Despite the renewed interest in gold mining at the turn of the twentieth century, no significant profits were made in Georgia. Although gold was produced, it yielded consistently lower amounts between 1880 and 1895. For example, mines in Lumpkin County, which had become the center of Georgia gold production, yielded a total of just over $1,000,000 over this 15-year period. The highest single-year total was $225,000 in 1882, with returns steadily declining to $33,551 in 1894 but bouncing back to nearly $42,200 in 1894 (Yeates et al. 1896:318-319). Overall, these returns were simply not enough to keep the larger mines in business. Nitze and Wilkens (1896:787), speaking of the entire southeastern gold-district, stated that in 1889 mining companies spent $535,000 to produce $318,000 worth of bullion. This loss came after investments of $5,900,000 in infrastructure.

Through the first quarter of the twentieth century, gold was a minor product of Georgia. Census data indicated a steady drop in the value of gold produced from nearly $125,000 in 1901 to $19,000 in 1909. By 1919, gold was not included as a separate industry among mining and quarrying (U.S. Bureau of the Census 1902, 1913, 1922). The state continued to produce gold through the 1930s, however. According to U.S. Geological Survey (USGS) reports, both placer and lode mining were conducted in Georgia during this period. Placer mining was more common in that there were usually 2-3 times as many placer mines operating. Most of the gold came from the Lumpkin County area with the rest coming from other scattered locations. In general, production ranged from a maximum of 993 ounces in 1935 to a low of 450 ounces in 1936, although there were some significant fluctuations from year to year (Dunlap and Meyer 1933, 1934, 1935, 1936, 1937, 1938, 1939, 1940; Martin 1941, 1943a, 1943b).

The USGS reports indicated other aspects of gold mining in Georgia during these last years. Lode mines operated at a small scale, with mills usually having no more than five stamps. Also, the lode mines often ran part-time or seasonally, with the reports noting that particular mines operated for a few weeks or months and that the ores collected were not milled immediately. Notably, in some cases, raw ore was shipped out of state for processing and smelting. The reports indicated that some of the placer mines focused on saprolite deposits using draglines and processing the excavated material with screens and sluice boxes. In general, however, the several operating and planned mines exhibited variety in how they processed ore and gravel (Dunlap and Meyer 1933, 1934, 1935, 1936, 1937, 1938, 1939, 1940).

As noted, Georgia mines produced no gold after 1953. Before then, however, any significant production stopped in 1942 when the War Production Board issued Limitation Order L-208, which required nonessential gold mines to shut down so that the labor and equipment could be put toward activities that were deemed more necessary.

Iron Ore

Georgia has three basic types of iron ores: fossil iron, brown iron, and magnetic iron. Brown iron and fossil iron are by far the most important of the three. Despite recorded deposits of magnetic iron that run along the Chattahoochee Ridge, and in Greene, Lumpkin, Haralson and Cobb counties, it was noted in the 1920s that magnetic iron ores had not yet been exploited in Georgia (Nesbitt 1896:72-73; McCallie 1926:84).

The main difference between fossil (red) iron and brown iron is that red iron ores are usually found in veins, while brown iron is recovered from a more mixed or disturbed environment. Usually brown ore are found in pockets, located within a clay matrix. In Georgia, fossil or red iron ores comprise around one-quarter of the total iron production of the state; the rest is brown iron (Nesbitt 1896:71-72; McCallie 1926:76).

Fossil iron ores, also known variously as red iron ores or Clinton ores, are found along the edge of the Appalachian Mountains, from western New York down to Alabama. In Georgia, the deposits are limited to the extreme northwest corner of the state, specifically the counties of Dade, Walker, Catoosa, and Chattooga (Figure 13). These deposits are the same basic age and origin as the iron ores found around Birmingham, Alabama (McCallie 1908:36; Cave 1922b:59-60; Furcron et al. 1938:57-58). This iron is found in veins, and the ore is either hard or soft, depending on whether it is buried. Buried material is generally hard, while exposed material is soft due to weathering. Weathering causes the ore to lose most of its calcium carbonate, which could comprise 20 percent of the ore's volume (McCallie 1908:164-165; McCallie 1926:79-81).

Fossil iron in northwest Georgia is basically limited to one bed found in Lookout Valley and Johnson's Crook, having an average thickness of three feet, increasing to seven feet in the vicinity of Rising Fawn (McCallie 1908:54-55). Because it is found in a vein, the mining methods used for fossil iron are different from those used to recover brown iron ores. The mining of fossil iron begins with the removal of the overburden, followed by stripping and pit excavation. This was followed by underground work in pursuit of the vein (McCallie 1926:79-81). The uses of these materials are often different too. While most fossil iron was used for the production of iron in the early 1900s, by the 1920s, it was usually crushed and used as an ocher in the paint industry (McCallie 1926:83).

Brown iron ores, also known as limonite or brown hematite, are generally found in three Georgia counties: Polk, Bartow, and Floyd. In Polk, the major deposits have been located near Cedartown, Fish Creek, Wray, Esom Hill, Etna Valley, and Aragon. In

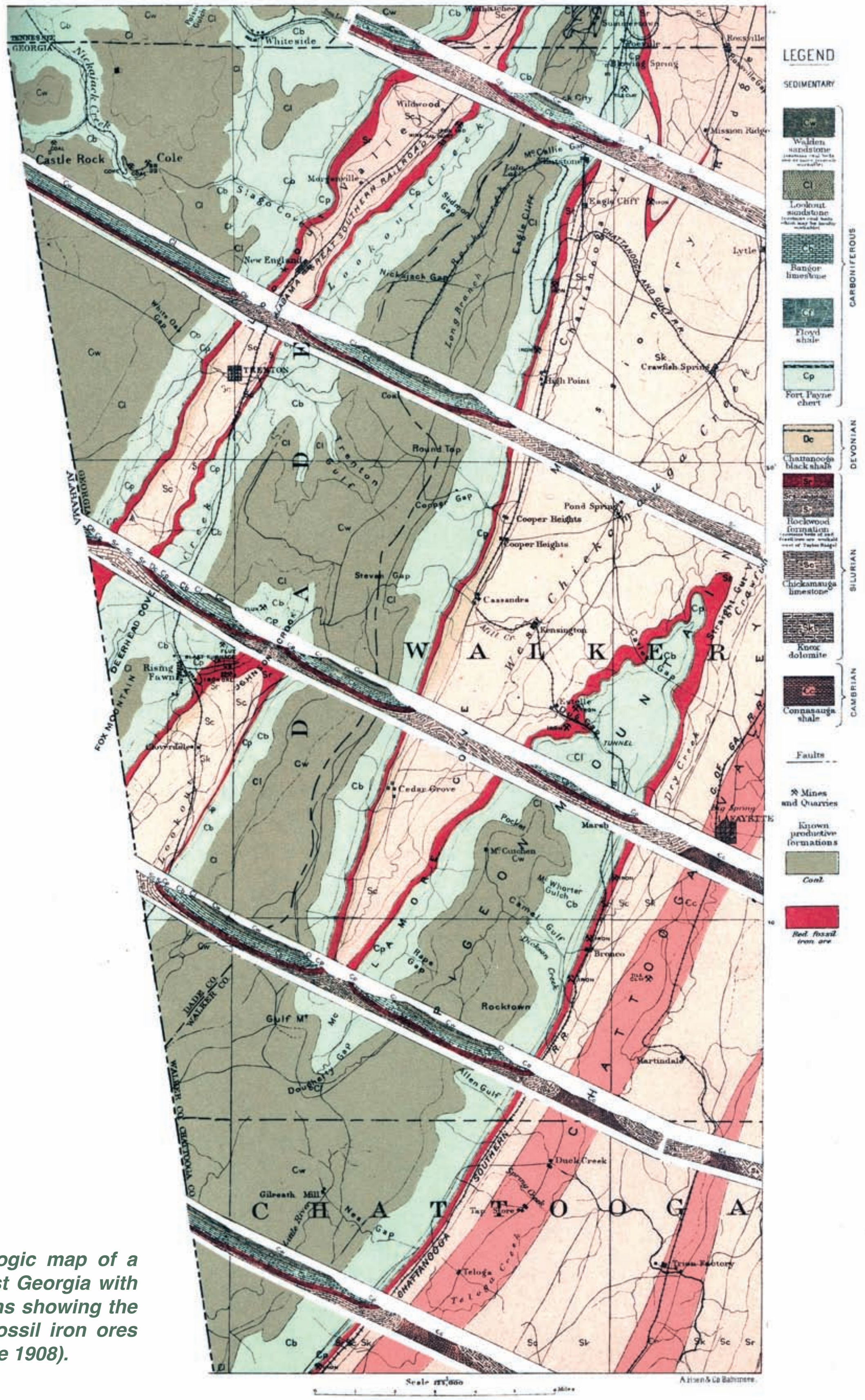


Figure 13. Geologic map of a part of northwest Georgia with structure sections showing the distribution of fossil iron ores (Source: McCallie 1908).

Bartow County, the deposits are located within the eastern part of the county in a broad band beginning two miles south of Emerson and extending north 16 miles to Sugar Hill. The Floyd County deposits are located around Cave Springs and Silver Creek (McCallie 1900:9-11; McCallie 1926:75; Furcron et al. 1938:57-58).

The first iron blast furnace in Georgia, using brown ores, was established on Stamp Creek in Bartow County around 1840. By the 1850s, there were five blast furnaces in the county, even though these were relatively small charcoal furnaces, located on Stamp Creek or along the Etowah River. Foremost among these was the Cooper Iron Works on the Etowah. These iron works were ruined during the Civil War, and though some started up again around 1870, they were not successful and soon closed (McCallie 1900:27; McCallie 1926:77-78).

Shortly after 1870, new establishments were set up in Polk and Floyd counties, beginning with Cherokee Furnace in Cedartown and the Etna Furnace in Etna Valley. Soon after, furnaces were established in Floyd County: one at Rome and another at Hermitage. By 1900, however, only Cherokee Furnace and the one at Rome were still in operation (McCallie 1900:28; McCallie 1926:77-78).

The mining techniques used in recovering brown iron ores differed from those used for fossil iron. Since the ores were found in a looser matrix, brown ore mining began with manual labor. Using a pick, shovel, and screen, workers picked out the ores by hand. Mining was done this way, supplemented by occasional blasting, from around 1840 to around 1905. Later, it was more common to use steam shovels and mechanical ore washers, which greatly increased mine output. It was noted that the steam shovel, which was operated by 5-6 men, could do the work previously done by 50, and at lower cost. Regardless of technique, all brown ore mining was performed using open cuts (McCallie 1900:26-27; Kesler 1950:57) (Figure 14).

Since the amount of clay and unwanted matrix material far exceeded the iron ore, the removal of the clay and other unwanted materials was an important aspect of brown ore mining. The removal of this material, called “beneficiation” or rendering, began when the bank ore was unloaded onto a “grizzly.” The bars of the grizzly were set between 2.5-6 feet apart, with the larger rocks discarded by hand. The ore was crushed mechanically and sent to the log washer, which might be single-log or double-log type. The clay that was washed out was sent to a mud pond. After the log washer, the ore was sent to a revolving or vibrating screen, where water jets removed still more of the remaining matrix material (Kesler 1950:57-58).

Figure 14. After the turn of the twentieth century, brown iron ore was usually mined in open cuts using steam shovels. Unknown mine, Bartow County (Source: Furcron et al. 1938).

Iron ore production in Georgia declined in the years after World War I, beginning with fossil iron and finally with brown iron. By the 1950s, the main iron producing areas in the state were the Cartersville and Cedartown districts, with only a small amount coming from Walker County (Minerals Yearbook 1955:260).

Manganese

Manganese is one of those materials that came into widespread use during the Industrial Revolution. Its uses are many, ranging from metallurgical to chemical. An estimated nine-tenths was used in the making of alloys of iron and manganese, such as spiegeleisen and ferro-managese, which in turn are used in the manufacture of steel. In chemical application, it was most commonly used in the manufacture of chlorine, but it was also used as a coloring agent. It even had a specialized application during World War I, as a preparation agent for the charcoal used in gas masks. Later, it had a function in dry cell batteries (Watson 1908:25; McCallie 1926:92-93; Furcron et al. 1938:63).

Found in various locations throughout the Piedmont and the Valley and Ridge, manganese is most notable along the Cartersville Fault, in Bartow, Floyd, and Polk counties (Nesbitt 1896:59). The Cartersville District is the largest and oldest of the manganese mining areas, followed by the Cave Spring District. Trailing behind these are the Draketown District, the Tunnel Hill District, the Varnell-Cohutta District, and the Doogan Mountain District (McCallie 1926:88).

In Georgia, manganese ores are usually found in irregular masses within a general matrix of clay. There are some vein deposits and these are the easiest to work, but vein deposits are not the norm (Watson 1908:18; McCallie 1926:89). In the Cartersville District, manganese often comes in the form of black manganese oxide, usually mixed with brown iron oxide (Watson 1908:50; Kesler 1950:53).

The first recorded production of manganese in the state occurred in 1866, right after the Civil War. From that time until around 1880, production was small-scale. One of the earliest mines was the Dobbins property, which yielded 5,500 tons between 1867 and 1885. Production increased in the years that followed, with other mines opening in Bartow, Polk, and Floyd counties. By 1887, Georgia was the second highest producing state, but even so, production was often uneven (McCallie 1926:90). During this period, most of the ore was shipped to Britain for bleach production and manufacturing steel. Georgia production took a dip in 1892-1893 due to large manganese finds in Russia, but soon rebounded. At this point, most of the state's manganese was excavated from the Cartersville District. By 1896, Georgia was known as the third largest manganese producer in the United States (Nesbitt 1896:73; Watson 1908:15-18).

World War I saw a huge increase in manganese production due to the spike in munitions manufacturing. This, though, was followed by a comparable drop-off in the years after the war (McCallie 1926:90; Kesler 1950:6). By 1920, there were only two ore producers in all of Georgia: the Republic Iron and Steel Company of Cartersville, which ran the Dobbins Mine; and the Cherokee Mining Company of Black Ridge in Fannin County, which ran the McKinney Mine (Cave 1922b:61-62). In the years that followed, production would be limited to the Manganese Corporation of America (Kesler 1950:6). Manganese ore production ceased altogether in Georgia after 1945, despite the advent of more prospecting done for the DMEA (Minerals Yearbook 1955:260).

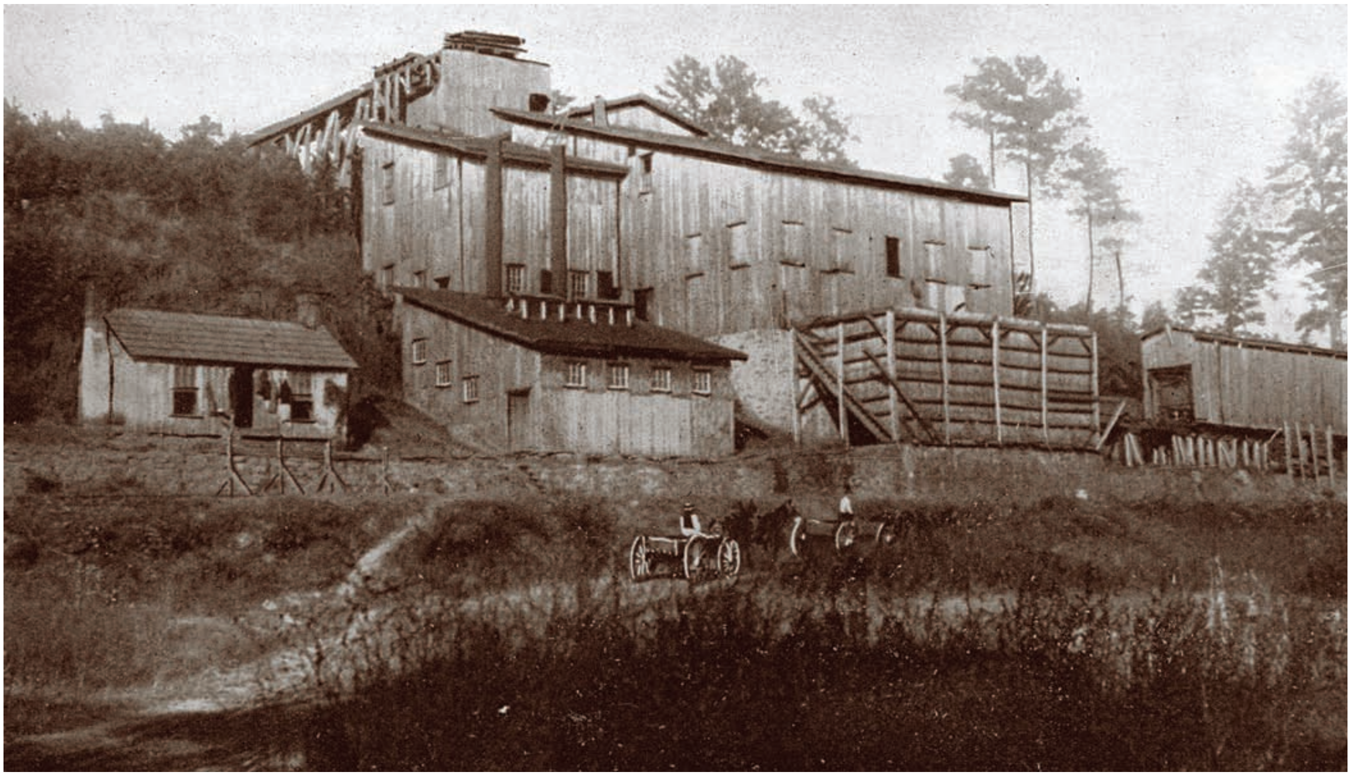


Figure 15. Although the distribution of manganese deposits did not always warrant the construction of large plants, some companies built extensive mills. Blue Ridge Mining Company plant, Bartow County (Source: Watson 1908).

The techniques used in the mining of manganese are somewhat different from what is usually done in Georgia. Much of the early mining was done underground, with pits, shafts, and tunnels, in pursuit of the higher grade materials that were often found in veins. "Mass mining," or open pit excavation with power shovel and hydraulic equipment, became more common in the years after 1900, when it became more common to search for manganese oxides in residual clay deposits. The one major exception remained the Will Lee Mine, which still was worked underground (Kesler 1950:6, 80-82; Furcron et al. 1938:63). Despite the occasional use of hydraulic equipment, especially at the Aubrey-Stephenson and Buford mines, hydraulic methods, as a rule, did not work very well (Kesler 1950:58). Dry mining remained the norm (McCallie 1926:91-92).

The location of a suitable manganese deposit is often signified by the presence of what is called manganese "float ore." This is material found on the surface that suggests the location of buried deposits. The most workable deposits are those located along ridge tops and their adjacent slopes. Another potential problem is low density of the manganese ores within the clay matrix. As late as 1908, it was still noted that manganese-mining operations often had to move from place to place in search for suitable ore density, and as a result, it was not profitable to tie up money in expensive permanent equipment (Watson 1908:26-29) (Figure 15).

As a rule, manganese ore was shipped out of state for processing, but it was essential to remove the ore from its residual clay matrix before shipment. Usually this could be achieved simply by washing the excavated material. In the early days, this washing was by hand, using a revolving cylinder equipped with holes and a steady stream of water. The ore was put into the cylinder and revolved with the water until the clay was completely removed. This was quite satisfactory so long as the amount of material processed remained relatively small (Watson 1908:27-28).

In later years, as steam shovels came into general use, it became the custom to use "log washers." This consisted of a long box, several feet thick, which was elevated at one of the ends. Inside this long box was the "log," which itself was between 25 and 40 feet long. This log was a long cylinder that had iron blades positioned in a spiral inside the log. As the log revolved, the ore and matrix material were placed into the lower end of the box. The material was forced upward by the spiraling blades, while water, introduced throughout the process, removed the clay (Watson 1908:28).

Pyrites

Pyrites, also known as iron pyrites, are often identified chemically as disulphide of iron (FeS2). It is also called "fool's gold," since it looks similar to that metal in its raw form. The sulphur composition is about 53 percent, with the remaining 47 percent comprised of iron. In the case of pyrites, the element sought after is sulphur. The main use for pyrite is in the manufacture of sulphuric acid, which is used in a number of different industrial functions, especially in the manufacture of iron and steel. Sulphuric acid was also used in the making of fertilizer, and if necessary, explosives (Shearer and Hull 1918:5).

In Georgia, there are four general kinds of pyrite deposits, and only two of these are of any commercial value: metamorphosed pyrite veins (usually associated with Roan gneiss), and limestone replacements (associated with Ducktown copper deposits). Of these two, the most important by far are the metamorphosed pyrite veins, which are found in a band 10 miles wide and around 150 miles long, extending from Rabun County in the northeast, to Carroll County in the southwest. Loosely associated with the state's gold belt, this pyrite belt includes the areas around the towns of Dahlonega, Creighton, Marietta, Hiram, Villa Rica, and Bremen (Shearer and Hull 1918:21).

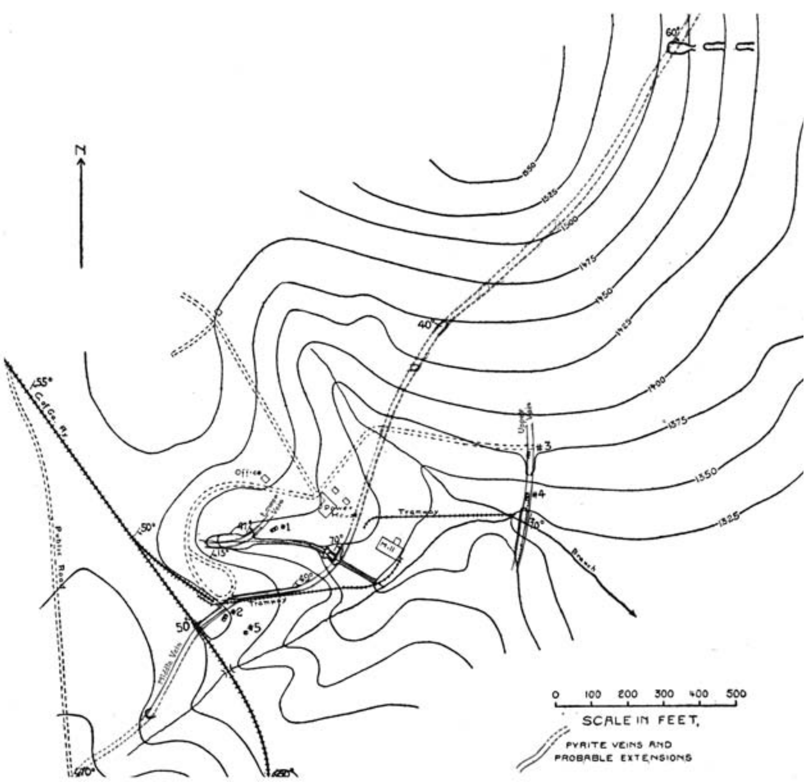
Interest in pyrites began with gold mining, around 1830. Associated geologically with both gold and copper, pyrite pits were sunk all over north Georgia in the years before the Civil War, looking for first gold and later copper, especially after the Ducktown copper discoveries of the 1840s. Despite this widespread prospecting, the only viable mines found as a result of this work were those associated with the Ducktown District, and the Canton Copper Mine in Cherokee County. Despite the name, the Canton Copper Mine would yield more pyrite over time than copper (Shearer and Hull 1918:7).

As for pyrite itself, little use was made of the mineral until the early 1880s, when the Georgia Chemical Company opened the state's first pyrite-burning acid plant in Atlanta. This sulphuric acid plant was the first of its kind in the South and was supplied by the Tallapoosa and Little Bob pyrite mines, located in Haralson County and near Dallas in Paulding County, respectively. Despite a promising start, the plant was closed by 1890 due to cheap sulphur imported from Sicily and Spain. After it closed, the only pyrite-burning plant in the United States was located in Natrona, Pennsylvania (Shearer and Hull 1918:7; Cave 1922b:66-67; Long 1971:16; Furcron et al. 1938:81). Even as late as 1896, when the pyrite belt was well known and there was a market for sulphuric acid, the state's pyrite resources were underexploited (Nesbitt 1896:68-69).

The first successful pyrite mine in Georgia was the Villa Rica Mine, opened in 1899 by the Sulphur Mining and Railroad Company. This operation ran successfully until 1917. Other mining operations commenced in the years that followed. The Southern Star, Reeds Mountain, and the Swift mines were all opened between 1905 and 1915. The Standard Mine began operation in 1913 (Shearer and Hull 1918:7-8). Despite this expansion, mining operations remained intermittent until World War I (Figure 16).

The heyday of pyrite mining in Georgia was between 1916 and 1919 due to the collapse of European imports and the wartime demand for sulphuric acid for explosives manufacture. In 1916, there were only two mines in production, but this increased to five the following year. Georgia was soon ranked seventh in pyrite production in the nation (Shearer and Hull 1918:1, 4; Furcron et al. 1938:78-80). This production dropped off after 1918, and all Georgia pyrite mining had ceased by 1920 due to the import of cheap sulphur from Latin America (Cave 1922b:66-67; Crickmay 1952:16). The local pyrite industry remained dormant in the years that followed, despite a brief resurgence of interest in pyrite and mica exploration and mining around Upson County in the 1950s (Long 1971:16).

Figure 16. Several pyrite mines opened during the early 1900s, including the Reeds Mountain Property, Carroll County. Map of part of the Reeds Mountain Mine showing locations of mines, cuts, the mill, and associated structures (Source: Shearer and Hall 1918).



Specular Hematite

Specular hematite is one of the many varieties of hematite, which is basically an ore for iron. One of many iron oxides, specular hematite comes in different colors, but is often red. Iron ore mining is discussed earlier in this report.

Most mining for specular hematite in Georgia occurred between 1875 and 1900. At that time, it was mined from open cuts, with a small amount acquired from underground tunnels. The main mines during that period were the Red No. 1, Red No. 2, and the Roan mines. There was little activity during most of the twentieth century, but the major exception was the Bartow Mountain Mine, opened up in 1941 (Kesler 1950:7, 60, 88).

NON-METALS

Asbestos

Asbestos, a fibrous silicate material, has been known for a long time and has a number of relatively modern applications. Its heat and fire-resistant properties have long been known, and it has been used to make special cloth and padding since at least the Middle Ages. Beginning in the 1850s, asbestos became popular on a more industrial scale, and was used in the manufacture of paper, specialized clothing, ribbons, and even girdles. When electrical facilities mushroomed in the late 1800s, it was prized as insulation material (Hopkins 1914:76-77, 92).

Figure 17. The Sall Mountain Company asbestos plant, White County (Source: Hopkins 1914).

In the years after 1906, asbestos was used in the manufacture of building shingles until at least the middle of the twentieth century (Hopkins 1914:117), when health issues associated with asbestos production became recognized.

Raw asbestos is found at various locations within the Appalachian Mountain region, from Canada to Alabama (Van Gosen 2006). There are different varieties of asbestos, but the ore is usually found in two basic types: mass-fiber and slip-fiber. Mass-fiber asbestos contains fibers joined into a mass without any particular orientation; slip-fiber asbestos has its fibers in a uniform orientation. Slip-fiber asbestos is usually found in veins, while mass-fiber is found in more irregular masses within a matrix of other materials. Most of the asbestos found in Georgia is the mass-fiber type (Hopkins 1914:77, 87-88, 96-97). The fibers themselves can be either long or short, and most of the asbestos found in Georgia is of the long variety (Furcron et al. 1938:12).

The peak of asbestos production in Georgia occurred roughly between 1894 and 1908 (Hopkins 1914:113). The successful mining areas included Sall Mountain, Nacoochee, and the Berrong Properties (White County); the Miller Property, Burton, and Pine Mountain (Rabun County); and the Camp Property (Coweta County) (Hopkins 1914:87-88). It was soon apparent that the best deposits were located in White, Habersham, and Rabun counties, with lesser deposits in the counties of Towns, Lumpkin, Hall, Cherokee, Jackson, Walton, Morgan, Fulton, Meriwether, and Hancock (Cave 1922b:50).

The first and most successful of these mining areas was Sall Mountain in White County (Figure 17). When it was opened in 1894, it was the first asbestos mine in the entire United States (Hopkins 1914:76-77, 92; Cave 1922b:50). Before that, most asbestos used in this country came from Canada (Nesbit 1896:80).

By 1914, there were at least three main asbestos mines in Georgia, which was the second largest asbestos-producing state in the nation. In addition to Sall Mountain, there was Pig Pen Mountain Mine in Rabun County, and the W. T. Worley Place, seven miles east of Canton, in Cherokee County. In addition to the three main mines, there were two active asbestos processing plants, the largest being the one associated with Sall Mountain. At that time, all asbestos mines were either open pits or quarries (Hopkins 1914:104, 107). By 1922, Sall Mountain was the only asbestos mine still operating in Georgia (Cave 1922b:50).

In 1926, the Sall Mountain Asbestos Company, located at Sall Mountain in White County, was listed as the only commercial producer of asbestos in the state. Among the other asbestos mines listed, but no longer in operation, were the Miller Property, two miles northwest of Burton in Rabun County, and the National Asbestos Company at Hollywood, in Habersham County (McCallie 1926:9-10). By 1938, even the Sall Mountain Mine was closed, and it was lamented that, “at one time, Georgia was the largest asbestos producing state in the Union. Sall Mountain, White County, Georgia, is a famous location for long-fibered asbestos” (Furcron et al. 1938:12).

Georgia’s era of asbestos mining might have been over, but a small amount of the material was still mined as late as 1952. This was done by the Powhatan Mining Company, which operated in Meriwether and Rabun counties (Minerals Yearbook 1955:261).

Cement

The history of cement starts with mortar, which has been a standard building material since the beginning of civilization. Regular lime mortar was traditionally made by burning limestone and mixing the resulting lime with sand and water. This worked reasonably well for the construction of most early buildings, but it did not harden underwater and was not strong enough to stand on its own as an independent construction material (Maynard 1912:32). Both qualities were increasingly important requirements for construction.

In the 1800s, this led to the development of “natural cement,” which consisted of natural deposits of limestone and clay with specific chemical compositions that after firing and grinding, produced a dry mixture that set and hardened into a rock-like substance when wet, even underwater. Natural cement was first used in the United States in 1818 during the construction of the Erie Canal. In the South, the first rock suitable for natural cement was found in 1829 in Kentucky and what is now West Virginia (Maynard 1912:32, 59). Other sources quickly emerged. While natural cement was better than mortar, it tended to yield inconsistent results because of its natural composition.

Portland cement, which became increasingly popular in the later 1800s, was an improved product compared to natural cement. It consisted of an artificial mixture of lime, silica, alumina, and iron oxide combined in certain proportions. The mixture was burned to create a semifused mass called clinker, which was then finely ground (Eckel 1905). First created by John Aspdin of Leeds, England in the early 1800s, the original product was said to be similar to the stone found around Portland, England. Even though Aspdin’s original formula was greatly modified over the years, it always kept the name “Portland” (Maynard 1912:32).

Although more difficult to make than natural cement, Portland cement began to supplant natural cement in the 1890s. The first Portland cement plants in the South were established in Virginia and Alabama in 1900 and 1901. By 1903, there were three more plants, including one in Georgia: the Southern States Portland Cement Company in Rockmart (Maynard 1912:59).

In the years that followed, cement production in Georgia was basically divided into two main categories: natural cement and Portland cement. The production of natural cement, which has been done in Georgia since at least 1851, was mostly concentrated in just two places in the 1800s: the towns of Cement in Bartow County and Rossville in Walker County. At the peak of natural cement production in Georgia, around 1900, there were three outfits in operation: Howard Hydraulic Cement Company at Cement Station, Bartow County; Georgia Cement and Lime Company, Linwood, Bartow County; and Chickamauga Cement Company, in Rossville, Walker County. All of these had closed by the 1920s (Cave 1922b:53; McCallie 1926:24-26).

The first Portland cement plant in Georgia, located near Rockmart, began operation in 1903. This was the Southern States Portland Cement Company, owned by H. P. Vandeventer. By the mid 1920s, there were two areas producing Portland cement: around Rockmart in Polk County, and in Clinchfield, Houston County (Cave 1922b:53; McCallie 1926:24-26) (Figure 18). In the 1950s, the industry still centered in these areas, although only two producers remained in all of Georgia: the Southern States Portland Cement Company in Rockmart and the Penn-Dixie Cement Corporation in Clinchfield (Minerals Yearbook 1955:261). With regard to mining, cement companies mainly exploited sources of limestone. Cement plants might be located near the quarry or at a distance where they received raw materials from various sources.

Chlorite

Chlorite belongs to a group of phyllosilicate minerals and has physical properties similar to those of talc and mica. It is often used to make bleaches, or as filler in other products. In the 1920s, the only known commercial deposits were found five miles west of Canton in Cherokee County. Only one company exploited this deposit, the American Mica Company (Cave 1922b:53). By the early 1950s, chlorite was mined in both Cherokee and neighboring Pickens counties (Crickmay 1952:2).

Clays and Kaolins

Clays are earthy materials that are flexible or plastic when wet, and are capable of being molded and holding shape when dried. Further, they harden when burned or fired. Most clays are derived from the breakdown of rocks as a result of weathering. Pure clays are often made of hydrated silicate of alumina. Kaolins, or white clays, are the most rare and valuable of the commercial clays. Basically a form of hydrated silicate of alumina, kaolins are comprised of roughly 40 percent alumina, 46 percent silica, and around 14 percent water. This basic combination holds for most other clays, although they are less pure (Veatch 1909:17-33).

Clays are found throughout Georgia. Clays in north Georgia can be kaolin-like (almost pure white), derived from disintegrated limestone and calcareous shale, or from disintegrated shale, like that in the

Figure 18. The Rockmart area in Polk County was one of the production centers of Georgia cement. Piedmont Portland Cement plant, Polk County (Source Maynard 1912).

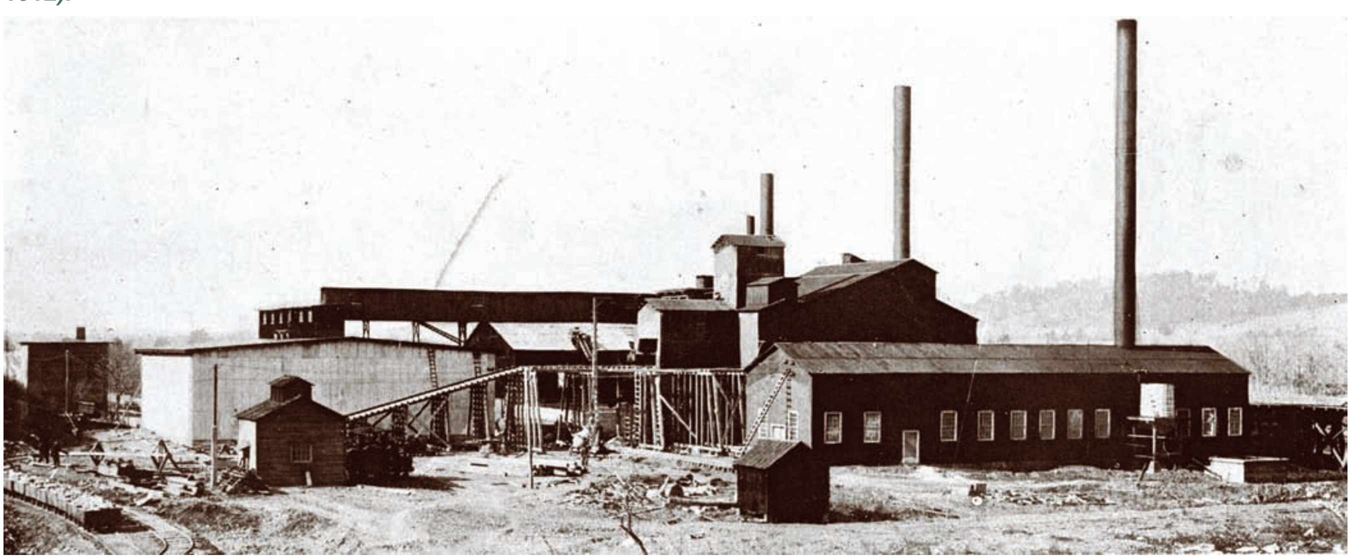


Figure 19. Kaolin remains a significant mineral industry in Georgia and produced raw materials for national and international markets. Clay pit of the Georgia Kaolin Company, Twiggs County (Source: Veatch 1909).

Rockmart area of Polk County. Clays formed from alluvial deposits are usually found near or south of the Fall Line (Nesbitt 1896:69).

In the 1800s, clay was commonly used in potteries for making farm and household vessels. These were very localized clay industries that had little long-distance value. The development of a more comprehensive rail system, however, allowing bulky, low cost items to be transported increasingly greater distances. By the early 1900s, an industry that had been limited to clay (kaolin) vessels and bricks for local use, had expanded to include the manufacture of sewer pipes, roof tiles, and terra cotta, sometimes for the far-flung markets (Veatch 1909:286). In general, brick clay and resulting products was used locally while kaolin, except for some potteries and special brick manufacture, was almost always exported outside the region. By the 1920s, there were kaolin mines in Floyd, Bartow, Walker, and Chattooga counties in north Georgia, but the most commercially valuable clays were found near the Fall Line, with most operations located within Baldwin, Richmond, Taylor, Twiggs, and Wilkinson counties (Cave 1922b:53-54; McCallie 1926:28-32) (Figure 19).

By the 1930s, kaolin was the most valuable clay shipped out of Georgia, and the state produced over half of the total white clays mined and used in the entire country. Kaolin was not only used for ceramics (mostly by industrial producers in the northeast and Midwest), but it was also used as a surfacing material in the manufacture of paper, as well as for many other industrial products (Furcron et al. 1938:8-9).

By mid-century, the mining and production of clays, including kaolin and Fuller's earth, comprised just under half of all of Georgia's mineral production. It was the state's most lucrative export, generating greater profits than limestone and marbles (Minerals Yearbook 1955:261-262). Presently, it is the most valuable mineral resource produced in the state.

Corundum

Corundum, an oxide of aluminum, is one of the world's hardest minerals. Only diamonds are harder. Transparent varieties of corundum, with blue and red hues, are known as sapphires and rubies, respectively. Industrial uses of corundum included the manufacture of aluminum, but bauxite quickly replaced it. From the late 1800s through the early 1900s, corundum was prized as an abrasive, being the essential ingredient on an emery wheel or emery paper (high-grade sand paper). There were also corundum bricks and whetstones. By the late 1930s, the use of corundum declined with the development of artificial abrasives (McCallie 1926:51; Furcron et al. 1938:31).

Corundum was known to be present in Georgia since at least the 1840s, when it was often found in conjunction with gold deposits. When corundum became important in its own right, the mineral was re-discovered in north Georgia in the early 1870s by an Englishman named Thompson. Thompson's find would become the Laurel Creek Mine, located in Rabun County, 15 miles east of Clayton. For several years, Thompson worked the deposit, but not diligently, as he was more interested in asbestos than corundum. Dr. H. S. Lucas of the Hampton Emery Company of Chester, Massachusetts, purchased the Laurel Creek operation in 1880 and immediately began open-pit mining operations. Within 12 years, he had reached a depth of 130 feet while working on a vein around eight feet wide. Subsequent prospecting revealed a corundum belt some 40 miles wide that extended from North Carolina to Alabama, roughly corresponding to the Chattahoochee Valley. This belt is mainly within the counties of Rabun, Towns, Union, Lumpkin, Habersham, Hall, Cherokee, Cobb, Forsyth, Paulding, Douglas, Carroll, Troup, and Walton. In these areas, corundum was usually located in basic magnesian rocks or igneous intrusions within the area's crystalline rock formations (Nesbitt 1896:65-66, 80; Cave 1922b:55-56; McCallie 1926:47-48; Furcron et al. 1938:31-32).

Despite the presence of the corundum belt, the Laurel Creek Corundum Mine was always the state's main producer. Other mines operating during the late nineteenth century were d the Track Rock Corundum Mine in Union County and the Edison Mine near Acworth, which yielded the largest piece of pure corundum ever mined, weighing almost 100 pounds. In 1892, a massive hill slide marked the beginning of the end of the Laurel Creek operation. When the mine closed in 1893, corundum production in the state virtually ceased (Nesbitt 1896:67; Cave 1922b:55-56; McCallie 1926:45-48).

Feldspar

Feldspar, usually mixed with potash and soda, is an essential ingredient for the manufacture of porcelain and other white ceramics, glazes, and enamels. It is also used in scouring and polishing soaps. Feldspar is added to some glass, as well as tar and asphalt roofing. It has even served as grit for domestic chickens. Found in various locations in Georgia, feldspar was never mined or exploited commercially on a large scale. Only a small amount was ever shipped out of Georgia (McCallie 1926:52-54).

Production in the state apparently ceased after the 1951 fire at the Appalachian Minerals Company mill in north Georgia (Minerals Yearbook 1955:262).

Fuller's Earth

Fuller's Earth, also known as bleaching clay or attapulgite, is a clay-like material or earth that has traditionally been used to decolorize, filter, or purify oils and greases left from animal, mineral or vegetable sources. Although it is clay-like, it is more porous and less plastic than clay, which allows it to absorb greases and oils (Cave 1922b:56; McCallie 1926:54-56).

In Georgia, most deposits of Fuller's Earth are found in the Sandhills and south of the Fall Line (Furcron et al. 1938:24). There are three different deposit areas in the state. The first is in Decatur, Grady, Thomas, Lowndes, and Toombs counties. The second covers a bigger area: Twiggs, Bleckley, Houston, Crawford, Wilkinson, Jones, Baldwin, Washington, Hancock, Jefferson, Burke, Richmond, and Columbia counties. The third is much smaller and localized to Stewart and Randolph counties.

Despite covering such a wide area, there have only been two plants that mined Fuller's Earth in Georgia. These were the Atlantic Refining Company at Attapulgas in Decatur County (later the Attapulgas Clay Company) and the General Reduction Company in Dry Branch, near Whigham in Grady County (Cave 1922b:56; McCallie 1926:54-56). Fuller's Earth was mined much like regular clay, with the exception that it was never washed. It was, however, dried and pulverized before shipment (McCallie 1926:54-56).

Granite and Gneiss

Georgia granite has been put to many uses, including building stone, monumental stone, street curbing, and crushed stone. It is historically one of the leading commercial mineral resources of Georgia, being just behind kaolin and clay in total value (Furcron et al. 1938:55; Crickmay 1952:2). Because the main deposits are so far from the coast or navigable rivers, industrial-scale production depended on the development of the local railroads (Watson 1902:33). Early commercial rock quarrying, however, mostly served local markets.

Granite and gneiss, a more laminated form of granite, outcrop in the Piedmont region where they are the prevailing rocks. By the 1920s, when the granite industry was in full development, there were a number of mining centers, including Stone Mountain, Lithonia, Elberton, Oglethorpe, Lexington, Sparta, Eatonton, Odessa, and Newnan (McCallie 1926:67). Most of the quarries were in just two main zones. One covered the area bounded roughly by Stone Mountain, Lithonia, Lawrenceville, and Covington. The other was around Elberton and Athens (Watson 1902) (Figure 20).

Figure 20. The Georgia granite industry reached a peak in the 1920s. Unidentified quarry, Elbert County (Source: Furcron et al. 1938).

Stone Mountain granite was noted for its even texture, medium grain, and light gray color. It was considered ideal for building purposes, bridges, and mausoleums. Lithonia granite, which was more gneiss-like in structure, was known for its fine grain and was considered ideal for curbing and paving stone. Elberton granite, which was gray to blue-gray, was good for either buildings or monuments (Furcron et al. 1938:52-53; McCallie 1926:71).

Granite quarrying in Georgia began around Stone Mountain. The big dome was worked around the edges as early as the1845-1850 period, soon after the area was settled by Euro-Americans. Systematic mining did not begin until after the Civil War, when the Stone Mountain Granite and Railroad Company provided access to the area in 1869. Production increased after the Venable Brothers purchased the mountain in 1882. With its granite transported throughout the nation, Stone Mountain quickly became the main granite quarry in Georgia and remained so until well into the 1890s (Watson 1902:113; McCallie 1926:69).

Until 1891, the main granite quarries in the state were Stone Mountain and Lithonia, but granite quarrying began at the Coggins Quarry near Elberton that year and other mines soon followed near Lexington and Sparta. By the 1920s, this region surpassed the Stone Mountain area in total production. Along with building stone, the Elberton area also specialized in crushing rock for aggregate, railroad ballast, and artificial sand (McCallie 1926:69-72; Furcron et al. 1938:53) (Figure 21). With both the Stone Mountain and the Elberton areas in production, the big years for Georgia granite were between 1890 and the 1920s. Since that time, the state's granite industry entered a period of relative decline, but it is still in operation. It did not experience the collapse seen in many other mineral industries in the years after World War I.

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Graphite

Graphite had a wide range of uses. Traditionally used in the manufacture of lead pencils and crucibles for molten metals, it was later used for lubrication, for paints designed to cover metals, and other foundry uses, and sometimes was used as filler in commercial fertilizers. With the advent of commercial electricity,

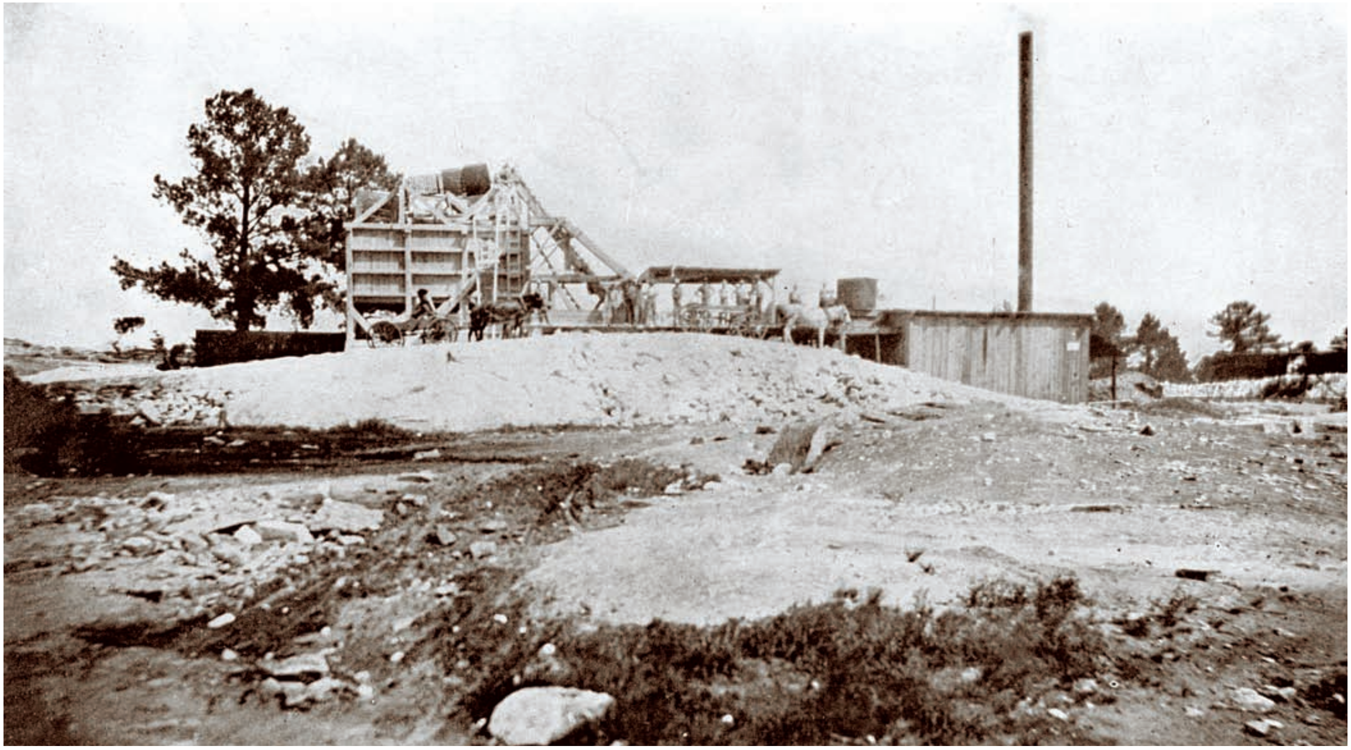


Figure 21. Many Georgia quarries produced crushed rock for various uses. Granite crusher at unidentified quarry, Lithonia (Source: Watson 1902).

the high conductivity of graphite led to its use in dynamos, batteries, and other electrical devices (McCallie 1926:75; Furcron et al. 1938:55).

Graphite was found in various locations in the Piedmont, but the largest deposits were limited to Bartow, Cobb, and Pickens counties. Joseph F. Allison was the first to mine for graphite, working in the Emerson District of Bartow County as early as 1892. The American Graphite Company began working in the same general area around 1902. Even 20 years later, these were the main two graphite operations in the state, despite some prospects located at Sharp Top Mountain in Pickens County (Cave 1922b:58; McCallie 1926:73-74). In 1896, R. T. Nesbitt (1896:79) stated that a large graphite deposit was opened in Elbert County, but did not seem to have been worked in a substantial way.

In the 1920s, a graphite deposit was opened on the north side of the Broad River, eight miles northeast of Danielsville in Madison County. Even though it had supposedly been worked "since slavery times," it is unlikely that it really produced anything that early. This operation closed by 1938. Another late graphite operation was the Southern Mining and Milling Company in Clarkesville, Habersham County, which started taking graphite from a mica and kyanite mine in 1937 (Furcron et al. 1938:56).

Kyanite

Unlike most materials recovered from north Georgia, which declined in production after World War I, the value of kyanite, or aluminum silicate, was realized only after the war. The finding that aluminum silicate contributed to improved spark plugs for airplane engines instigated a search for deposits in north Georgia and other locations, leading to the discovery of kyanite and similar minerals, such as sillimanite. Kyanite, usually found in conjunction with mica and schist, was found in commercially viable deposits in Habersham and Rabun counties (Furcron et al. 1938:59-61).

Up to the 1930s at least, Philip S. Hoyt of the Southern Mining and Milling Company, based in Clarkesville, Habersham County, was the only kyanite producer in Georgia. He started working with kyanite in the 1930s, even though by then the material was mostly used in the manufacture of glass tank blocks (Furcron et al. 1938:59-61).

The Southern Mining and Milling excavation operation was done manually, by pick and shovel, largely because that was the easiest way of selecting the best beds of kyanite. Once excavated, the material was hauled to the mill in trucks. Another operation, the Carolina Minerals Corporation in Habersham County, mined the crystals by hand, shoveling decomposed schist containing kyanite into a flume, which carried it to the mill. Larger crystals were screened out and the remainder was put through a muller, consisting of a pair of rubber-covered wooden wheels that ran over the crystals in a tub and rubbed off the adhering flakes of mica and quartz grains. The crystals were either handpicked or water was added to the crushed material to separate the lighter materials in the overflow (Prindle 1935; Furcron et al. 1938:61) (Figure 22).

Figure 22. Kyanite production was on a small scale in Georgia and conducted by just a few operators. Picking table and washer, Georgia-Carolina Minerals Corporation (Source: Prindle 1935).

Limestone

Limestone is a carbonate rock that may varieties of general limestone, crystalline dolomite, and—at the high end of durability—marble (Kesler 1950:17). Also called calcareous rock, limestone formed as a precipitate from a solution of calcium carbonate, or, more commonly, from massive deposits left from seashells and marine skeletons. Limestones can encompass everything from soft chalks, to the most common form of cryptocrystalline limestone, to phenocrystalline marble (a detailed discussion of marble is presented in a separate section below). There is also magnesian limestone, travertine or Mexican onyx, and "hydraulic limestones," suitable for crushing for the manufacture of hydraulic cement (McCallie 1907:23-30).

All limestones contain calcium (lime). Pure limestone is a calcium carbonate, which might appear as a calcium oxide or a calcium dioxide. To be considered limestone a rock usually has to have at least 50 percent calcium carbonate. All limestones found in north Georgia are believed to have come from marine deposits laid down when much of the area was part of an extensive shallow sea (Maynard 1912:1-3).

Limestones have a truly wide range of uses. In addition to building stone and mortar, which are perhaps its most popular functions, it also has applications in the manufacture of paper, leather, and sugar. As lime, it is used as an agricultural fertilizer. Crushed limestone is used in road building and is essential in the manufacture of hydraulic cement. There are also applications in the manufacture of various metals, from copper and lead to steel (Maynard 1912:3-17; McCallie 1926:86). One of the main uses of limestone, by volume, is the production of cement.

In 1896, the most successful limestone operations were those around Graysville in Catoosa County, and around Cartersville (at "Cement") in Bartow County. The operation at Cement specialized in hydraulic cement. At that time, it was generally assumed that the state's limestone potential had not been fully tapped (Nesbitt 1896:70). Several years later, it was noted that limestone mining had to be as cheap and local as possible to be competitive in pricing. This usually meant open quarrying, with the best situation a hillside location (Maynard 1912:56).

By 1920, there were three main limestone producers in the state. These were the Ladd Lime and Stone Company of Cartersville, in Bartow County; Hooker Crushed Stone Company of Chattanooga Tennessee, which operated in neighboring Dade County, with a quarry in Hooker, Georgia; and Empire Cement and Limestone Company of Cartersville, which operated in Polk County (Cave 1922b:60-61). These firms produced raw material for cement, mortar, plaster, and other products. By 1952, only the Ladd Company in Cartersville remained in operation (Minerals Yearbook 1955:262).

Marble

Although related to limestone, marble is stronger, polishes easily, and provides a superior building material. In addition, it is easier to work and more versatile than granite. In addition to structural uses, marble is also prized for monuments, statuary, and decoration. Beginning in the late 1800s and continuing to at least the middle of the 1900s, marble has been one of the greatest mineral industries in the state of Georgia, with most commercially valuable material recovered from the Tate and Marble Hill areas of Pickens County (Furcron et al. 1938:64-65; Crickmay 1952:2).

Most commercial marble in Georgia comes from the "Marble Belt," some 60 miles long and only 1 to 3 miles in width, located in Fannin, Gilmer, Pickens, and Cherokee counties. This is the location of the best marble vein. There is a lesser outcrop located near Whitestone on the Pickens-Gilmer line, but this material is usually crushed or ground for the market (McCallie 1907:31; Furcron et al. 1938:64-65).

The first use of marble near Tate in Pickens County is dated to 1840, when Fritz T. Simmons fashioned marble tombstones by hand. This marble came from hillside exposures rather than from any regular quarrying operation. The finishing work was later done by two mills: one near Marble Hill and another on Longswamp Creek, two miles east of Jasper. In 1850, Tate, Adkinson and Company started a regular quarry near the present site of the Georgia Marble Company operation, soon expanding it to include two mills for manufacturing tombstones. The Tate-Adkinson operation was bought out by Simons and Hurlick, which ran a quarry and mill east of Jasper. The Civil War, in particular Sherman's Atlanta campaign, ended all of these operations. For almost 20 years after the war, regional marble operations remained small and local (McCallie 1907:17-18; Cave 1922b:62-63; Furcron et al. 1938:68).

The low output of these quarries is illustrated by a story told of the construction of the state capitol building in Atlanta. When plans for the new capitol were drawn up in 1883-1884, a legislative committee went to Pickens County to determine if the known deposits

Figure 23. The Southern Marble Company mill, marble yard, and Quarry No. 1, Pickens County (Source: McCallie 1894).

could produce enough marble for the construction of the building. Seeing only a small tombstone operation, the committee recommended importing most of the building material from other states but suggested there might sufficient Georgia marble for the floors of the lobbies and the corridors. As a result of this decision, the capitol of Georgia was constructed of Indiana limestone instead of Georgia's own marble. In the years that followed, Georgia marble became famous and was used for the construction of thousands of buildings, including several capitols of other states (Furcron et al. 1938:68).

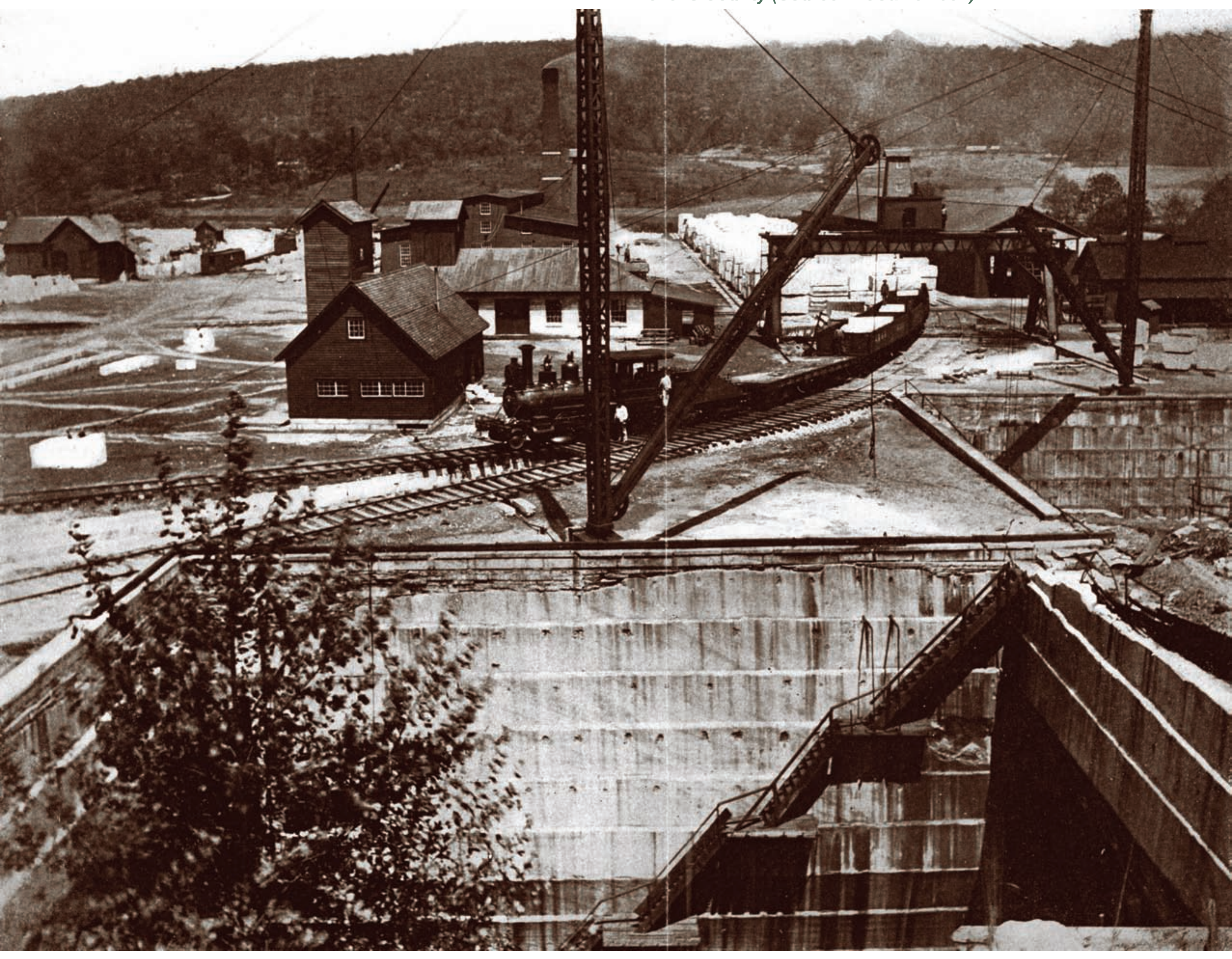
Miles and Horne, general contractors for the state capitol, set up the Southern Marble Quarries Company to provide materials for the capitol's staircases and tiling. They also did other marble work (McCallie 1907:19-20) (Figure 23). It took a few years before Georgia marble was fully accepted as a building material, however, and until the erection of the Equitable Building in Atlanta in 1891, local marble was considered suitable only for dressing and interior work. Even as late as 1912, Georgia marble was not considered the best building material because of its clay impurities but was considered better suited for trim work. By the 1920s, though, this was no longer the case and when Georgia marble was sent as far as Puerto Rico for construction of the capitol building there (Maynard 1912:12-13; McCallie 1926:101).

The turn-around occurred with the creation of the Georgia Marble Company, which was the first outfit to begin large-scale marble production in Georgia. Organized in May of 1884 with a capital reserve of $1.5 million, Georgia Marble Company was started by H. C. Clement of Chicago, a major stockholder in the large marble quarries of Rutland, Vermont. A believer in Georgia marble, he obtained access to 7,000 acres near Tate in Pickens County, and soon Georgia Marble established its own railroad connection to the Marietta and North Georgia Railroad (later the Louisville and Nashville Railroad). The company also opened its own mills (New York Times 1884; McCallie 1907:19; Furcron et al. 1938:68-69) (Figure 24).

The production of the Georgia Marble Company was so prodigious that within 10 years of its formation, the company had made Georgia the second largest marble producer in the nation, after Vermont. By the mid-1890s, Georgia Marble had five quarries running in the Tate area: Creole No. 1, Creole No. 2, Cherokee, Etowah, and Kennesaw. A sixth quarry, Piedmont, was in Pickens County (Nesbitt 1896:76-78). By the turn of the century, the value of Georgia's annual marble production was put at around $743,000, second to Vermont. The marble was used for a number of purposes, but the most popular were monuments, building materials, and ornamental work (McCallie 1907:21).

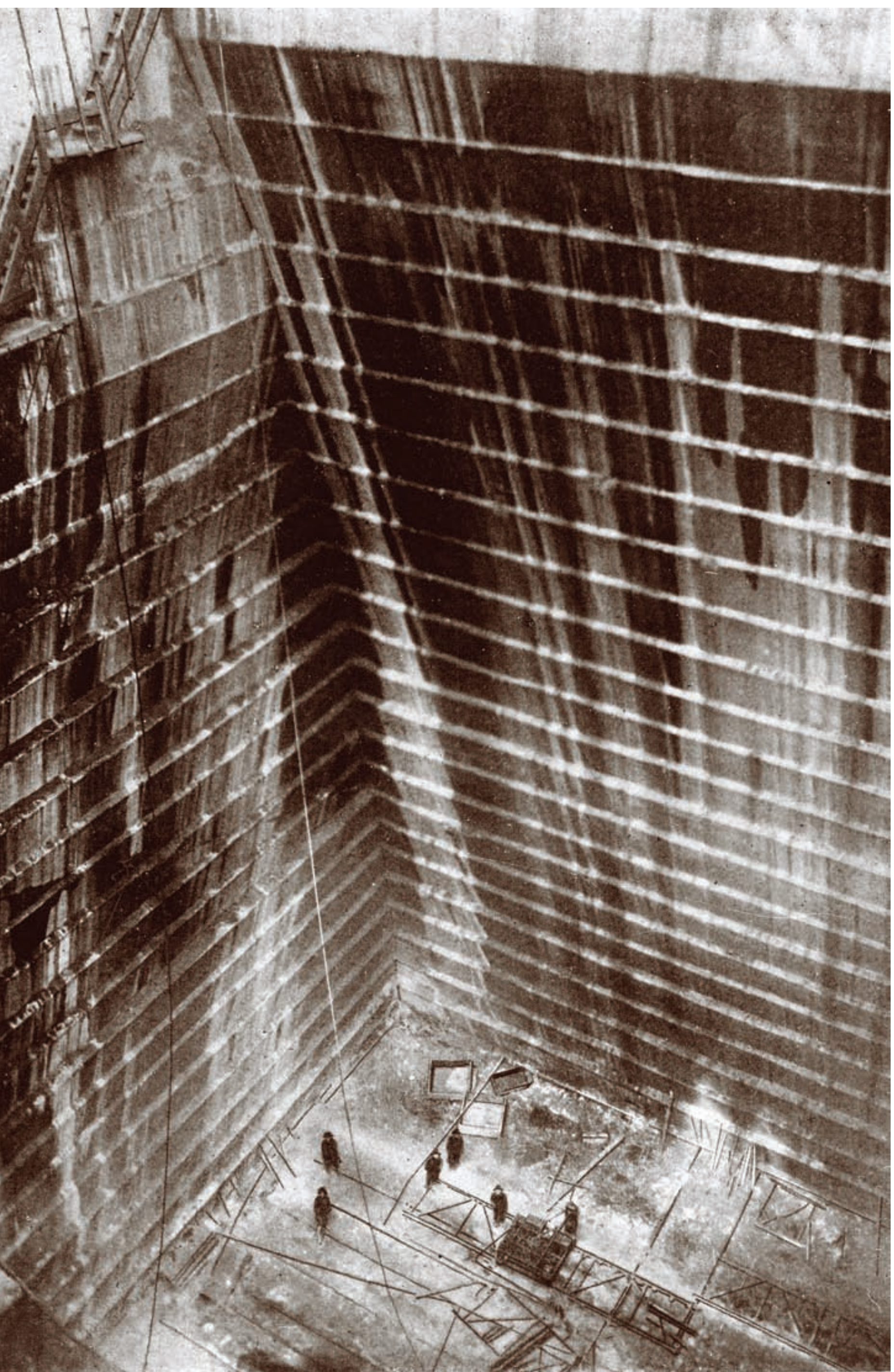
Other companies sprang up beside Georgia Marble. The Piedmont Marble Company and the Blue Ridge Marble Company were established in 1886, but these firms experienced problems and were already out of operation by 1907 (McCallie 1907:20). By the early 1920s, there were three marble producers in the state, and all were located in Pickens County: the Georgia Marble Company near Tate; the North Georgia Marble Products Company, operating at Whitestone; and the Willingham Stone Company (Cave 1922b:62-63). By 1938, Georgia Marble had absorbed its competitors and became the only marble producer in the state (Furcron et al. 1938:68-69).

Figure 24. Quarry and mills, Georgia Marble Company, Pickens County (Source: McCallie 1907).



As quarried in Georgia, marble was removed from massive open-air pits (Figure 25). The Tate quarries were pits, while the smaller Marble Hill quarries usually started out as hillside excavations. The pits were usually around 100 feet wide, with a length of between 100 and 250 feet. Depths reached between 100 and 200 feet below surface. By 1938, the Tate quarries had begun the first underground operations. This, however, was not the rule, since it was generally cheaper to open a new pit closer to the surface than to dig tunnels. When a new adjacent pit was opened, a 10-15-foot wide wall of original material was left between the old pit and the new. This helped keep out the water that tended to fill abandoned pits (Furcron et al. 1938:69). Once out of the ground, the marble went to finishing plants for shaping and polishing. In 1938, there were six modern finishing plants located at Tate, Marble Hill, Ball Ground, Nelson, Canton, and Marietta (Furcron et al. 1938:69).

Figure 25. Marble quarries near Tate were usually massive pits. Georgia Marble Company, Creole Quarry No. 1, Pickens County (Source: McCallie 1926).



Mica

Mica is a naturally occurring mineral commonly found in various locations north of the Fall Line. It is particularly abundant in the Crystalline Belt (Piedmont) in the form of muscovite and black mica (biolite). In the late 1800s and early 1900s, mica had a number of electrical uses, such as insulation in heaters, irons, and toasters. Ground mica was used in roofing compound, and was even used for industrial grinding (Crickmay 1952:2; Furcron et al. 1938:70-72).

By the late 1800s, mica deposits had been found in many northern counties, such as Union, Fannin, Habersham, Cherokee, Banks, Murray, Hall, DeKalb, and Gwinnett, among others, but only those deposits in Union and Fannin had ever been worked. It was interesting to note that none of these deposits was being worked in 1896 (Nesbitt 1896:79-80).

World War I energized the search for mica and by 1919, there were at least five mica mines in Georgia, with a promising prospect located near Holly Springs in Cherokee County, about 10 miles southeast of Canton. The five mines were identified as the J. B. Barron Mine in Thomaston, Upson County; the Freeman and Brown Mica Mine, three miles south of Thomaston; the F. M. Cagle Mine, seven miles south of Jasper, Pickens County; the Kell Mine near Clayton, Rabun County; and the Marchman's and Persens Mines in Upson and Monroe counties (Cave 1922b:63-64).

Even though mining for mica reached a peak during World War I, it continued well into the twentieth century. By 1952, mica was mined in Hart, Rabun, and Habersham counties (Crickmay 1952:2). Another contemporary source stated that production was found in at least 10 counties: Cherokee, Elbert, Franklin, Hall, Hart, Jasper, Madison, Monroe, Pickens, and Upson. Scrap and flake mica was recovered from Hart, Pickens, and Upson. Much of this expansion in the search for mica was the result of a Defense Mineral Exploration Administration (DMEA)-funded mica exploration project (Minerals Yearbook 1955:262).

Ocher

Ocher, also known as iron oxide pigments, are usually found associated with brown hematite iron ores. It is used mostly for paints and other pigmented products but is also important in the manufacture of linoleum and oilcloth. Most Georgia ocher is yellow (Nesbitt 1896:73-74; Watson 1906:5-31, 77; Minerals Yearbook 1955:262).

The main commercial deposit of ocher in the state is located in an eight-mile long belt that is part of the Cartersville District in Bartow County (Furcron et al. 1938:72). Ocher mining in Bartow County began around 1877, under the auspices of E. H. Woodward. Woodward established a processing plant in Cartersville from which it was shipped to market by rail. After changing hands a few times, the ocher operation was bought out by the Georgia Peruvian Ocher Company in 1890. Georgia Peruvian installed modern equipment, and was soon sending shipments as far as Europe (Watson 1906:67-69) (Figure 26).

Three other plants followed, all in the Cartersville District: Cherokee Ocher and Barytes Company in 1898; Blue Ridge Ocher Company in 1899; and American Ocher Company in 1902. The four plants continued running through World War I, but by 1921, only three were operating: Georgia Peruvian, Cherokee, and a new one, New Riverside Ocher Company (Watson 1906:67-69; Cave 1922b:65-66). One mid-1890s source mentions a new ocher operation at Rockmart in Polk County (Nesbitt 1896:73-74), but it appears that this operation was short-lived.

During the 1930s, umber, often found in association with ocher, was mined "as 'soft' iron ore to be sintered." Sintering is the method of making objects from powder, by heating the material in a sintering furnace to a point just below melting, when the particles adhere to each other to form a solid object. The umber operation does not appear to have been very successful (Kesler 1950:6). By 1950, only one ocher producer remained in Georgia, the New Riverside Ocher Company in Cartersville (Minerals Yearbook 1955:262). This company continues to operate at the present time.

Both ocher and umber deposits are usually intermixed with limonite and clay, as well as smaller amounts of fine-grained quartz, muscovite, and sometimes traces of specular hematite (Kesler 1950:54). Early ocher mining was in open pits but by the time, the four main companies were operating, and certainly during World War I, underground mining was the norm (Watson 1906:71-72). Whenever there was open-cut mining, power shovels became increasingly

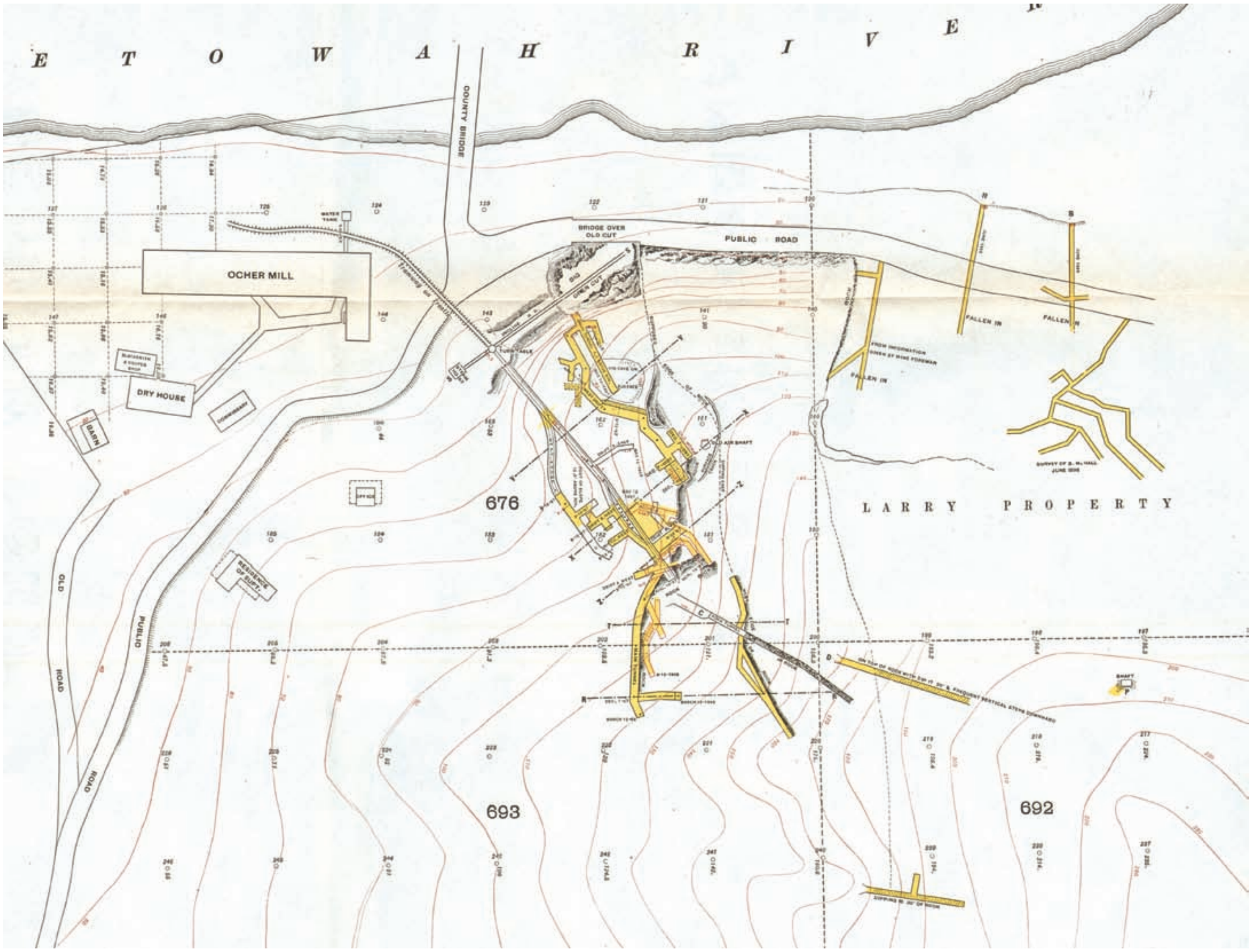


Figure 26. Map of the Peruvian Ocher Company operation near Cartersville (Source: Watson 1906).

popular (Kesler 1950:60). After excavation, the ocher was refined for shipment, a process involving removal of unwanted rock, sand, or clay by dissolving the ore in water, letting the impurities settle, and drawing off the ocher-bearing suspension. This was then was evaporated, and the ocher dried, and pulverized for shipping (Watson 1906:72-75).

Sand and Gravel

Sand and gravel has been used in Georgia for as long as there has been settlement in the state. In the early days, these materials were used locally, since there was no long-distance market for such a heavy, low-value material. This changed with the advent of the railroads, which began to crisscross the state in the 1800s. By the end of that century, as the “Good Roads” program became more popular, there was a growing demand for roads with prepared surfaces. The first materials used for these surfaces were sand and gravel, and these remained popular for road surfaces and bedding even after the rise of hard surfaced paved roads that became popular for main thoroughfares beginning in the 1920s.

Although found throughout Georgia, sand and gravel deposits are most prominent in the northern portion of the Coastal Plain (Cave 1922b:67-68). Sand and gravel quarries were also found in north Georgia, and one such quarry used in road preparation was a chert quarry near Summerville in Chattooga County (McCallie 1901:40).

By 1950, it was reported that sand and gravel production could be found in at least 17 counties, with sand forming around 90 percent of total production. By this time, ground sand, or sand made from crushing sandstone, was also available, even though there was only one ground sand producer in the state (Minerals Yearbook 1955:262).

Sandstone

Sandstones are found in many places throughout north Georgia, but the most prominent outcrops are found on the Chattoogata Ridge, Pigeon Mountain, Lookout Mountain, and Sand Mountain, all located in the northwest corner of the state. An excellent deposit of red sandstone is located in Catoosa County. Tripoli, a form of sandstone often referred to as "rotten stone," is often used as a polishing material. A sizable deposit of this material is found in Whitfield County, north of Dalton. In the 1890s, it was noted that shipments of excavated tripoli from Whitfield County were sent to the northern U.S. for processing (Nesbitt 1896:80-81).

Serpentine

Only one mine producing serpentine has been recorded in Georgia, and this was the Verde Antique Marble Quarry, located in Cherokee County, about two miles southwest of Holly Springs. First opened around 1897 by the American Marble Company, the mine was soon leased to the Verde Antique Marble Company of Chicago. The mine closed around 1919 (Cave 1922b:68).

Slate

SSlate has been considered the most useful of the various sedimentary rocks. There are igneous slates, but all of the known Georgia deposits are sedimentary (Shearer 1918:6, 17-18). Slate has a wide range of uses, perhaps the best known being for roofing material. It has also served as mill stock for flooring and tabletops, and has been used as chalkboards. In the early days of commercial electricity slate was commonly used as switchboard insulation. Despite its many functions, the material is brittle, and shaping it produces huge amounts of waste (Shearer 1918:38-41).

Most slate in Georgia occurs adjacent to the Cartersville Fault and is quarried in Murray, Gordon, Bartow, and Polk counties. The greatest concentration is found in the "Rockmart Belt" a line beginning three miles south of Cartersville and reaching five miles south of Rockmart (Cave 1922b:68-69). A smaller belt is located southwest of Cedartown in Polk County. A type of green-colored slate is found in the Fairmount Belt, beginning in Bartow County and extending north, through Fairmount and into southern Murray County (Furcron et al. 1938:88-90).

The first known slate quarries in Georgia were established near Rockmart around 1850. Joseph G. Blane was the first to see the commercial potential of the local slate. Even so, his operation never reached a very large size and it closed during the Civil War (Shearer 1918:1-2; Furcron et al. 1938:88-90). The slate quarries around Rockmart re-opened around 1880, including the former Blane property, which was sold to the Cherokee Slate Company (Cave 1922b:68-69). Southern States Portland Cement Company also started a large quarry on Land Lot 925 (Shearer 1918:1-2).

The years from 1880 to around 1900 represent the greatest growth of the slate industry around Rockmart. Until 1883, slate was hauled in wagons to Rome or to Cartersville, where it could be loaded onto railcars. By the mid-1880s, the area had its own rail connection, which greatly facilitated the local industry (Shearer 1918:1-2). From then on, the Rockmart quarries supplied the entire the state. In

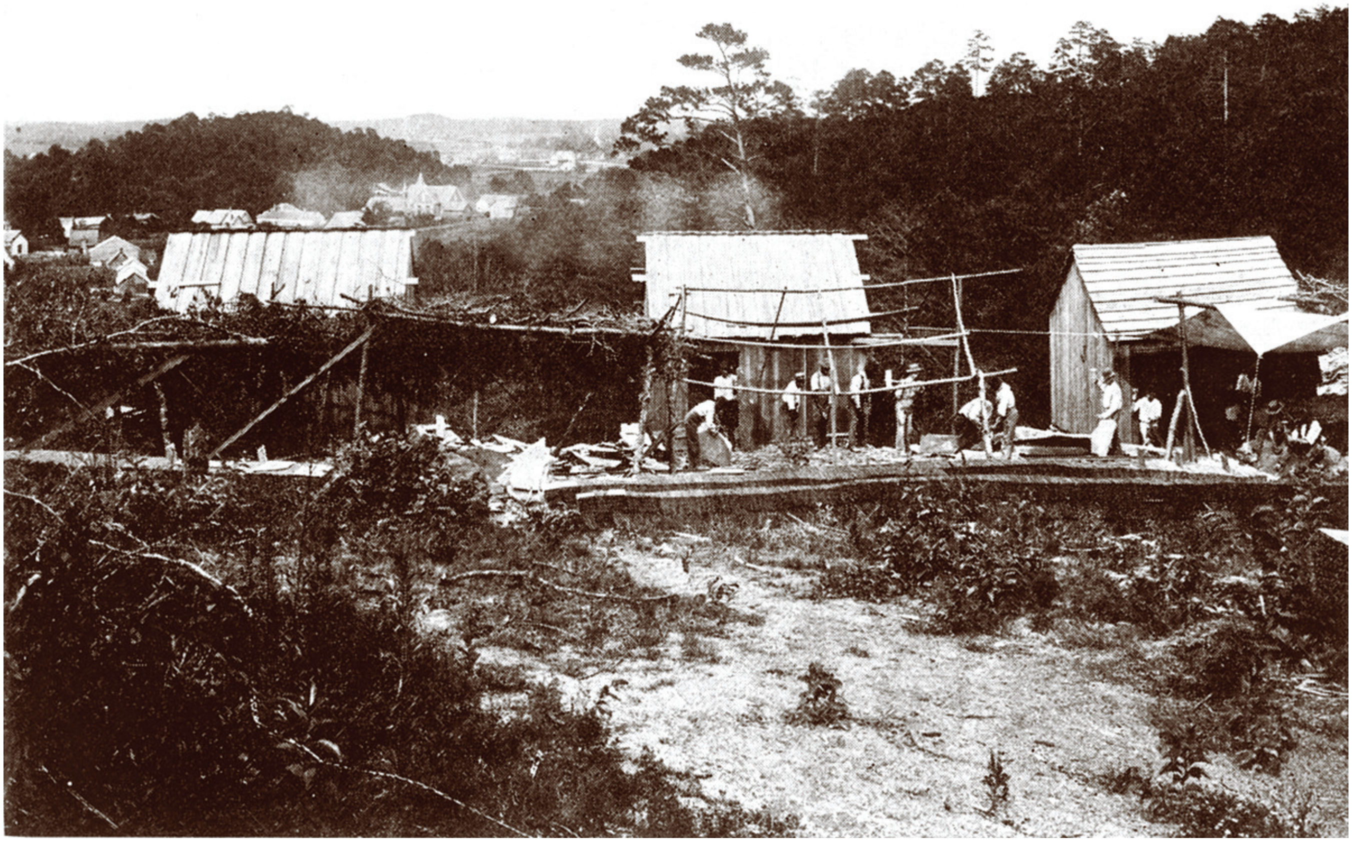


Figure 27. Production of slate roof shingles was done by hand by workers organized into work groups called "shanties." Splitting shanties of the Georgia Slate Company Dever Quarry, Polk County (Source: Shearer 1918).

1896, the Georgia Slate Company was responsible for most of this work, with almost all of the finished material going to the Atlanta market for use as roofing material (Nesbitt 1896:79).

There was a substantial drop-off in the demand for slate in the years that followed 1900 (Furcron et al. 1938:88-90). This was due to the increased cost of slate and the rise of other roofing materials that were considerably cheaper (Shearer 1918:2). The only partial exception to this decline was in the green slate belt, located in Bartow, Gordon, and Murray counties. This was worked by one firm, the Georgia Green Slate Company, which opened in 1910 but closed only a year or two later because of labor trouble and problems with the slate itself (Shearer 1918:3). In 1922, there was only one slate company in operation, the Richardson Company, which worked the green belt slate near Fairmount in Gordon County (Cave 1922b:68-69). Operations around Fairmount continued on and off for years. In 1952, the Funkhouser Company of Fairmount was still in business, although it produced slate flour and granules instead of slabs (Minerals Yearbook 1955:262).

Slate roofing in the United States was sold by the "square," each square consisting of enough material to cover an area 10x10-foot area. The size of individual pieces of slate that would go into making a square could vary, depending on the shape of the original rock, but usually ranged from 7x9 inches to 16x24 inches, with a thickness of one-eighth to one-quarter of an inch. The number of pieces within a square could range from 85-686. The price per square ranged from $3.50-10 (Shearer 1918:38). Hand manufacture of roofing was done by workgroups organized into "shanties," a term referring to groups of three workers rather than the structure they worked in (Figure 27).

As the demand for roofing slates declined, the industry introduced specialized machines to help reduce the wastage. One innovation was a slate-splitting machine invented by Vincent F. Lake around 1914. While it did reduce waste, it was not enough to save the industry as a whole (Shearer 1918:38).

Another relatively late development was the exploitation of sericite schist deposits in Pickens County as a possible source of potash, since this type of schist, virtually a form of shale, contained over 10 percent potash. These deposits already supplied "ground mica," which had uses as electrical insulation (Shearer 1918:165).

Talc and Soapstone

Talc is a soft white mineral that is ground to make a slick powder, with various cosmetic and industrial uses. In addition, talc of a certain quality could be cut into crayons. Soapstone is talc with impurities, making it firmer than regular talc. Talc has been found in a number of counties in north Georgia, but the largest deposits and the ones that have been exploited commercially, have been in Fannin and Murray counties. Fannin County is noted for its white talc deposits, while sources in Murray County, especially near Spring Place, produced a type of light green talc (Nesbitt 1896:80; Furcron et al. 1938:90-91).

The best talc mines were located around Chatsworth in Murray County, where talc mining began around 1873. The two largest firms were Cohutta Talc Company and the Georgia Talc Company. The important mines were located on the slopes of Fort and Cohutta mountains, and these often developed into elaborate underground workings.

By the early 1920s, there was only one mine left, the Georgia Talc Company, with a plant at Chatsworth (Hopkins 1914; Cave 1922b:69). The talc was ground into coarse-grained material used for roofing and fine-grained products for rubber tires and industrial pencils for marking steel. In the 1930s, it was said that the majority of the talc pencils made in the whole world were manufactured in Chatsworth (Furcron et al. 1938:90-91). Talc was still being extracted from Fort and Cohutta mountains as late as the 1950s (Crickmay 1952:2).

While most of the talc in Georgia was mined from either Fort Mountain or Cohutta Mountain, there were a few other mines in the same general area. In the 1930s, talc had previously been mined some 3.5 miles south of Blue Ridge in Fannin County, along the Louisville and Nashville Railroad, about two miles west of Ball Ground (Furcron et al. 1938:90).

Soapstone, which was a firmer material than talc, had some local application in fireplace, hearth, and chimney construction, especially in the early days of Euro-American settlement. The rise of granite and marble quarrying, but particularly the development of cement, ended most soapstone use as a building material (Hopkins 1914).

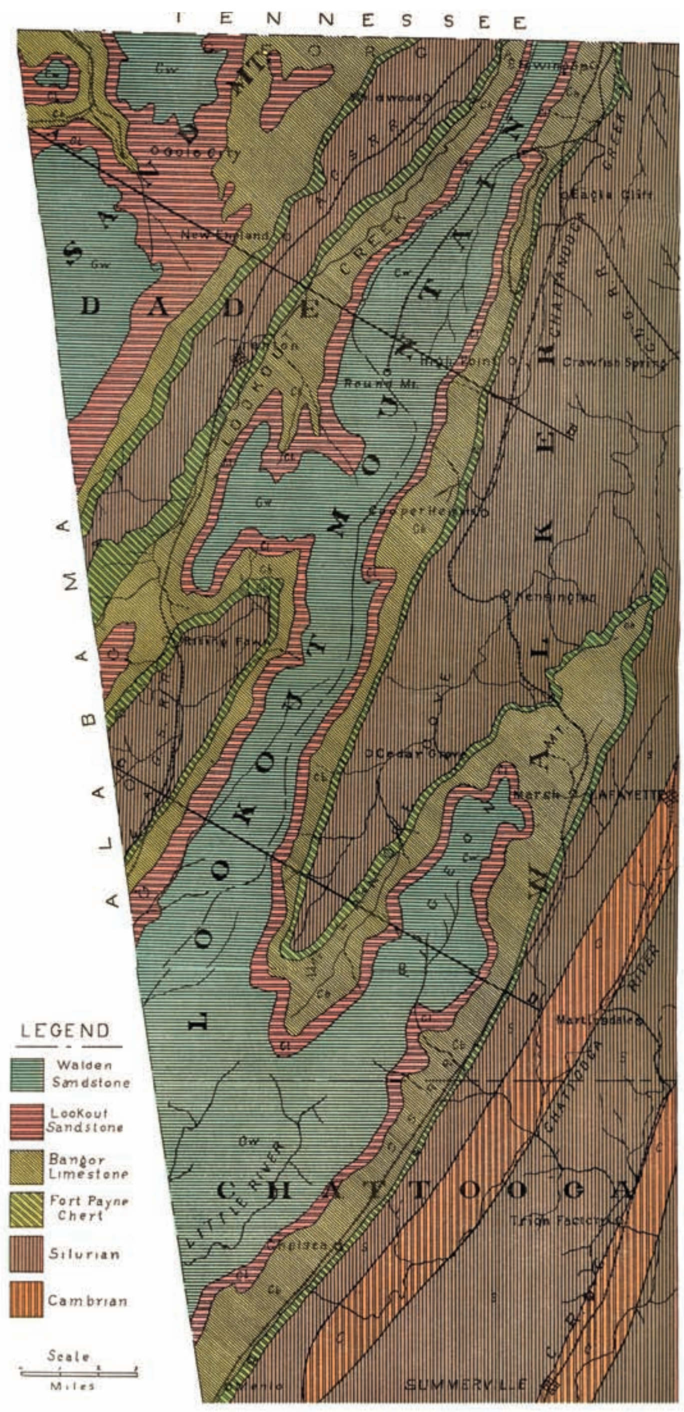


Figure 28. The highest quality coal in Georgia was from the vicinity of Lookout, Sand, and Pigeon mountains (Source: McCallie 1904).

MINERAL FUELS

Coal

Coal deposits in Georgia are limited to the Cumberland Plateau, located in the extreme northwest corner of the state. The Carboniferous rocks of that region produced high quality coal, with sources found in Dade, Walker, and Chattooga counties, and lesser deposits found in Floyd, Gordon, Whitfield, and Catoosa counties. All commercially viable deposits in the state are bituminous (Nesbitt 1896:60; McCallie 1904:9; Cave 1922b).

Within that northwest corner, the best coal deposits are located in the vicinity of Lookout, Sand, and Pigeon mountains (Figure 28). Before 1891, all coal in Georgia came from Dade County and the oldest mine, the Dade Coal Mine, was on Sand Mountain, near Cole City (McCallie 1904:61; McCallie 1926:35-36). Established by the firm of Gordon and Russell around 1870, it was the main coal producer in the state until 1893. The Dade Coal Mine developed into an extensive operation with 8,000 feet of tunnels and numerous galleries or "stopes." Most of the coal was hauled by wagon to Shellmound, Tennessee, to be converted to coke for use in local furnaces in northwest Georgia and east Tennessee (Nesbitt 1896:74; McCallie 1926:39).

In 1891, coal mining began at Round Mountain, spurred by the opening of the Chickamauga and Durham Railroad (McCallie 1926:39). The Durham Mines opened in 1891 and supplied the coke ovens of Chickamauga (Nesbitt 1896:74; Furcron et al. 1938:27-28). Coal mining continued in Georgia until then end of World War I, but declined dramatically afterwards. By 1922, only one coke plant remained in the state, Durham Coal and Iron Company, operating in Chickamauga (Cave 1922b:70). By the 1930s, nearly all coal production in the state had ceased (Furcron et al. 1938:27-28).

V. Mining Processes in Georgia

Georgia produced numerous minerals with economic value during the nineteenth and twentieth centuries. The processes of finding, extracting, and preparing these materials for sale resulted in the creation of historic feature systems and landscapes. Mining sites and individual historic and archaeological resources related to them are best delineated and understood with reference to the processes used in extracting and handling minerals (Noble and Spude 1992; CALTRANS 2008). The following descriptions of general and specific procedures used in handling ores and minerals in north Georgia through the first half of the twentieth century are intended to help researchers identify, understand, and evaluate individual historic properties and archaeological sites.

Certain aspects of mining provide further context for understanding historic sites associated with this activity. Mining, along with stone quarrying and borrow pits, is a materials handling venture that brought together capital, labor, and technology to gather and process minerals. Mining and quarrying differ from the excavation of rock and materials for highway, canal, and other grading projects in that mining deals with the mineral available for recovery rather than removing only what is necessary within the limits of a particular project. Mining is also a cyclical process in that each operation is done only once at a given place and then the location of mining shifts and the process is repeated. The successive operations are integrated into production systems so as to avoid bottlenecks and delays (Committee on Surface Mining and Reclamation [CSMR] 1979:31).

Mines go through life cycles that generally include discovery of a mineral, development and working of the mine, and closure. These stages may be relatively straightforward, particularly in earlier mines, or more complicated as mining interests have to account for external factors, such as health and safety and environmental laws. In addition, decisions must be made at points during a mine's lifetime respecting how to proceed with its development. For example, a mine begun simply to extract a mineral might be worth expanding with the addition of ore handling facilities and attendant infrastructure, such as power plants and administrative areas. The closure of mines also involves weighing the prospects for further profit, and these considerations are not entirely related to the extant ore bodies. Fluctuations in commodity prices can affect the profitability of a mine, for instance. Mines might be closed down permanently (abandoned) or temporarily, with the intention of reopening when commodity prices rise. Alternatively, an abandoned mine might be reopened using technology that can generate value from inferior ores or the same ores more cheaply (CSMR 1979:29-30). These different life-stages of a mine can leave varying material signatures for historians and archaeologists to interpret.

Regions also go through mining cycles that affect the nature of mining and resulting cultural resources. Initially, prospectors find and develop numerous small mines. Later, mining companies form and consolidate the smaller properties into larger ones. The cycle ultimately ends when the mines play out and the economic situation no longer makes mining worthwhile, causing it to stop (Gray 2003:245). Gray (2003) noted a variation on this progression in the Cartersville mining district of Georgia, where instead of ending, mining operations simply shifted through a succession of different minerals (Figure 29).

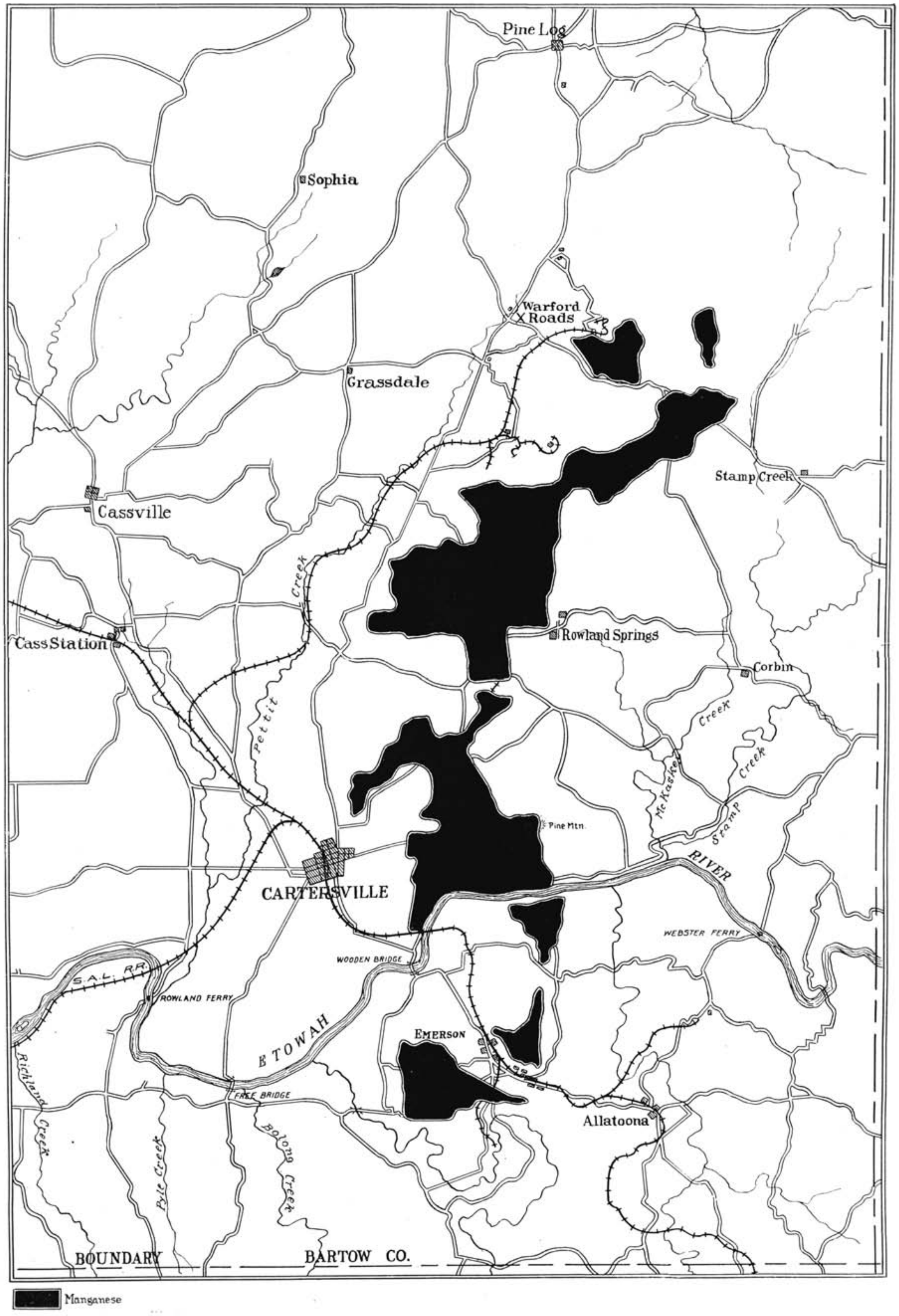


Figure 29. The area around Cartersville yielded several significant minerals, giving it an unusual historic trajectory. Manganese deposits in the Cartersville District (Source: Watson 1908).

The following sections describe the processes involved in extracting and processing ores as well as other mineral commodities in Georgia, including stone products, clays, and sand and gravel. Special attention is given to particular minerals that had greater importance or that were more commonly mined in the state, and which might, therefore, have a greater likelihood of occurring archaeologically.

MINING AND ORE DRESSING

Ore consists of natural mineral compounds of metal with some other substance such as oxygen or sulfur. To be worth mining, the valuable substances in a compound must occur in quality and concentrations high enough to make their extraction economically profitable (Thrush 1968; CSMR 1979:27). In mining, desirable minerals go through progressions that take them from the earth, breaking them free from the valueless rock, and then concentrating them into a form that repays the expense of the mining operation. The methods and organization of technologies used to accomplish these processes leave archaeological and structural remains that are the basis of identifying property types and feature systems (Noble and Spude 1992; Hardesty 1988; Hardesty 2010).

General procedures for dealing with ores were detailed in numerous textbooks and handbooks, but these sources do not provide specifics regarding the actual methods and technologies that miners used. Archaeology and history provide means for exploring the variation, innovation, and adaptation of mining (Hardesty 2010:29). Noble and Spude (1992) and Hardesty (2010) provide good overviews of these processes while various contemporary sources describe general processes and the specific procedures used in Georgia. The following sections provide a general explanation of the processes for extracting and handling mineral resources. Special or unique procedures applied to particular minerals are discussed under headings for those minerals to provide researchers with guidance in interpreting individual sites.

Mining and handling ores is divided into three principal stages: extraction, beneficiation, and refining. Extraction refers to the removal of minerals from the earth. Beneficiation is the process of upgrading the impure ores to increase their value. Refining converts the mineral into a state of purity suitable for industrial use, manufacturing, or commercial exchange (Noble and Spude 1992). It is important to note that a particular mining operation might use only one or a few of these processes or might combine them in different ways. Some operators produced only rough ore to ship elsewhere for refining, while others turned out finished products ready for direct sale to a consumer (CSMR 1979:27).

PROSPECTING

Prospecting, the search for valuable ore bodies, was the first step in the mining process and was conducted similarly for both tracer and lode deposits (Figure 30). Noble and Spude (1992:10) characterized mining as a speculative industry that required digging many test pits or “prospects” in the search for valuable minerals (Figure 31). Prospectors hand-dug holes (“prospects”) in locations thought to have geological formations containing valuable minerals. Mechanized prospecting developed in the early twentieth century and included power shovels, backhoes, bulldozers, and truck-mounted augers (Hardesty 2010:35).

In mining districts, prospects can be quite common and occur in tracer deposits in stream valleys, benches, and in streambeds. These holes are not actual mines but should be classified as prospects. Individual examples would not appear to have

Figure 30. The first step in the mining process was prospecting—the search for valuable ore bodies. Vermiculite prospect, unidentified location (Source: Furcron and Teague 1943).

Figure 31. Mining required digging test holes and trenches to find valuable minerals. Exploration trench, Standard Pyrites Company property, Cherokee County (excavation method unknown) (Source: Shearer and Hull 1918).

historical significance but they might reflect periods or phases of a region's mining history and can indicate the nature of a speculative phase of mining in the region (Noble and Spude 1992:10).

MINE DEVELOPMENT AND OPERATION

Extraction generally falls into two classes: surface mining and underground mining, both of which can be applied to placer and hard-rock formations. The specific type of mining used was a reflection of the physical location of the resource being sought and the available technology.

Surface Mining

Surface mining was extremely common in Georgia mineral industries. This method of extraction was used for minerals lying at shallow depths or those accessible at natural cuts, such as exposures along stream valleys (Figure 32). Different technologies also influenced whether and how surface mining was used. For example, while hand excavation had limits on the depths that could be cleared and mined from the surface safely and economically, mechanical excavating equipment made it possible to reach deep ores from the surface (Figure 33).

Techniques for surface mining included hand excavation (including animal-pulled drag scrapers) and bulldozing or other mechanical excavation methods, which are self-evident in how they were employed. Another method, hydraulic systems, involved directing high-pressure jets of water at a bank or mine face and washing the ore and waste material to the mill (see Figure 11). These systems were used so extensively at Georgia gold mines after the 1840s that they came to be known as the "Dahlonega Method" (Nitze and Wilkens 1896).

Figure 32. Surface mining by hand was suitable for shallow deposits or those at natural cuts. Fossil iron ore mining, Kensington Iron and Coal Company property, Walker County (Source McCallie 1908).

The development of a surface mine was a systematic process involving site preparation, removing, and disposing of overburden, excavating the material of interest, and transferring it to the processing plant. Moreover, these tasks had to be carried out in a planned way that considered how individual steps would lead to the next ones. The particular way the mine was organized and worked, however, depended on factors like the size of the operation, the materials involved, their physical location, and the technology used. Small-scale mining operations, such as took place at early placer deposits, would consist of simple pits or burrows with tailings (waste rock) located adjacent to them. For lode mining, small pits would be placed to expose the vein outcrop and follow it downward. Because these pits were dug following the ore, they were often uneven and more haphazardly arranged than larger-scale operations (CALTRANS 2008:86, 94).

Figure 33. Mechanical equipment made deeper surface mines possible. Drag line, Culbert Mine, Upson County (Source USGS 2006a).

Large-scale surface mines were methodical undertakings. For larger hand-excavated mines, development often started by terracing the working face of the mine, the top of each terrace providing workspace for the miners. Excavation proceeded by dividing the terraces and faces into sections and removing them systematically (Figure 34). A common technique for accomplishing this involved undermining the vertical face of a section, allowing it to collapse, and shoveling the loosened material into cars for removal (Crane 1910:160). Although thought of as an earlier and more primitive technique, hand excavation was sometimes combined with mechanical excavation because the workers shoveling the ore into cars simultaneously picked out and discarded the waste rock at the mine rather than scooping it together with mechanical excavators and taking the entire mass to the plant for sorting (Smith 1928; Munyan 1938:2). Excavation with steam-, air- and gas-powered shovels also involved standardized approaches to opening and working a mine. For example, after making an initial downward cut, the shovel worked the mine laterally in one or more directions, keeping the mine floor level and working in coordination with the hoisting or removal systems (Crane 1910).

Underground Mining

Underground mining developed to reach deeply buried ores. As with surface mining, methods included hand- and mechanical techniques using systematic procedures. Technology and methods reflected the geology of the ore body as well as the engineering solutions of accessing and removing it, while at the same time keeping the mines safe and

Figure 34. Working face and terraces in a surface mine. Clay pit of the American Clay Company, Twiggs County (Source: McCallie 1926).

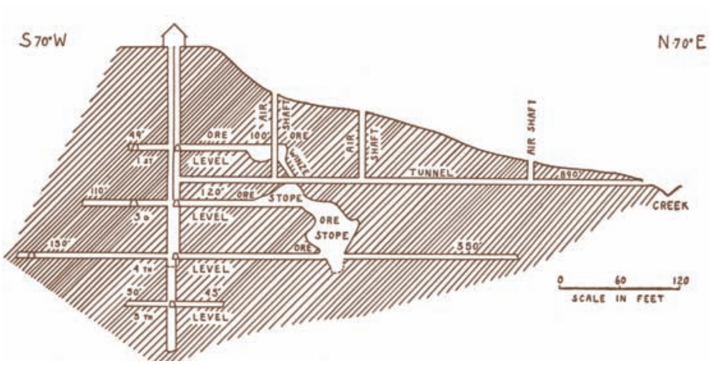
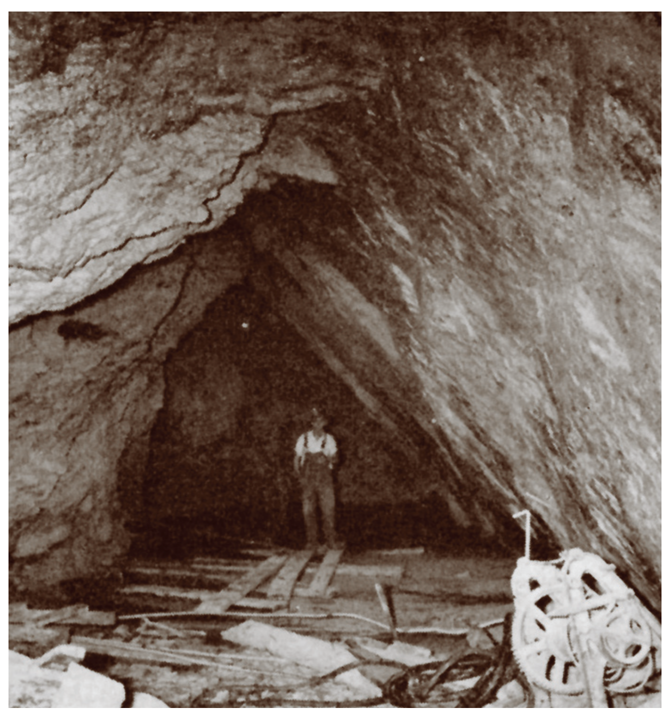


Figure 35. Underground mines were developed with networks of horizontal and vertical openings. Diagram of the Rich Pyrite Mine, Cherokee County (Source: Shearer and Hull 1918).

productive (Hardesty 2010:38). Underground mines were developed with networks of shafts (vertical openings), adits (horizontal openings driven from a topographic slope), and drifts (horizontal tunnels dug outward from shafts) (Figure 35). The exterior entrance to a mine was called a "portal" (Figure 36). Although "tunnel" was often used to refer to underground mine openings, miners used this word for horizontal passages with an entrance and exit (CALTRANS 2008:95). An individual mine could utilize one or more of these features in various combinations. Additional elements of a mine included cross cuts (horizontal tunnels running at angles to the axis of the ore body), winzes (shafts dug downward within the mine from a drift or other horizontal opening), and raises (vertical shafts dug upward to connect different levels of a mine's interior). Mines also included "stopes" -- large open spaces for extracting ore that were often stepped to access an inclined ore body. Creating and maintaining all these underground spaces required various support frameworks built of wood, metal, and later cement, as well as methods for clearing debris and water (Figure 37). Additionally, mines required ventilation, which was often provided with the arrangement of shafts and tunnels as well as with various pieces of equipment that helped circulate fresh air through the mine. Finally, moving ore, equipment, and people in and out of, and through, the mines, involved various hoists, tracks for trams and ore cars, and other machinery, as well as power plants (Hardesty 2010:38-43).

Figure 36. Adit portal showing timber framing and wooden tracks for ore cars. Note the mine tailing immediately outside the portal. Cohutta Talc Company mine, Murray County (Source: Hopkins 1914).

Figure 37. Where the surrounding rock was solid enough, no structural support was installed. Underground view of the Southern Mine (talc), Murray County (Source: Furcron et al. 1947)



Excavation underground proceeded by hand with picks and shovels. Air-powered hammers and rock drills were introduced during the nineteenth century and their primary use was to make holes for black powder, and later dynamite. As excavation moved forward, hand excavation, power tools, and blasting created piles of ore, which were then cleared by hand ("mucking"), loaded, and hauled to the surface (Hardesty 2010:41).

Working a mine through a single shaft or adit was known as the "rat-hole" system and was most often associated with smaller operations. A more elaborate method, known as planned mining, entailed removing the ore through elaborate networks of drifts, crosscuts, winzes, and raises. Mining at this scale and degree of complexity required more planning than the rat-hole system and involved constructing a well-organized strategy for getting to and removing the ore and providing ventilation. The system could only be planned and built with detailed knowledge about the shape of the ore body, which was obtained through exploratory drifts dug about 100 feet apart and at different levels (Hardesty 2010:41-43) (Figure 38).

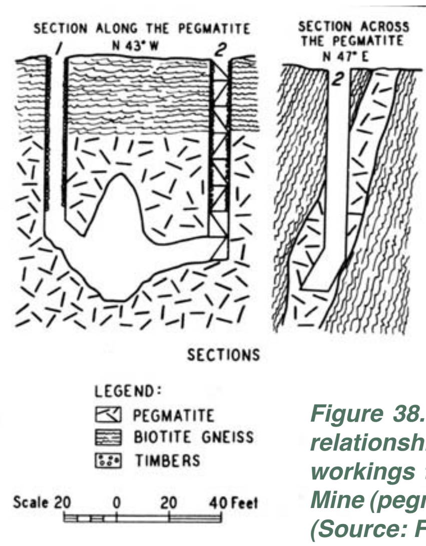


Figure 38. Diagram showing the relationship of underground workings to the ore body. Battle Mine (pegmatite), Monroe County (Source: Furcron et al. 1943).

Hoists, Ventilation, Drainage, and Transportation

Mines required systems of winches, hoists, and other devices to move ore, equipment, people, and waste in, out, and within the workings. Hoists were mainly associated with shafts, steep inclines, or open pits, which utilized similar technologies as stone quarries (see below). The simplest lifting methods had the miners carry sacks of ore and waste rock by hand up and down a ladder. Another simple method used a hand- or animal-powered windlass to winch containers up and down the mineshaft. The horse-powered version was known as a "whim." Mechanical versions, used mostly during the late nineteenth and early twentieth centuries, were powered with small steam engines. Headframes, consisting of tower-like structures built over the mineshaft, were associated with powered hoisting mechanisms. The frame suspended a sheave or pulley while an engine raised and lowered supplies, ore, and people. Materials being hoisted through the shaft rode in varieties of cages. Early versions were simple open platforms, while improved—and safer—versions had enclosed sides. Initially rope was used for lifting but the introduction of metal cables increased speed, depth, and capacity of the hoisting equipment (Hardesty 2010:49-51) (Figure 39).

Another requirement of underground mining was ventilation. Poorly ventilated mines could have deadly consequences and various methods were developed to keep air circulating, the two most common being forced air and drafts. Early forced air methods used in the western United States included large bellows and wind sails, consisting of cloth bags that filled with air and pushed it into the mines through tubes. By the 1860s, large industrial blowers and fans were developed. Creating drafts to ventilate the mine was a matter of planning, and required that all the interior tunnels, stopes, and other openings be connected to allow air to circulate naturally (Hardesty 2010:52-53). In some instances, miners dug shafts or air vents into the mine specifically to help air circulate.

Flooding was a common problem in mining operations. Drainage could be handled either mechanically or by arranging the mine to allow water to flow out of an adit placed in the hillside at a level below the flooded mine. Using the hoisting equipment to bail the water was another method. Later, mechanical pumps were developed to handle floodwater (Hardesty 2010:53-55).

Networks of trails, roads, and tramways were the most common method of transferring ore from the mine to the processing plant. Miners or pack animals would sometimes carry the ore or haul it in cars over trails and roads. Ore cars were often used in workings to move the excavated material through and out of the mine. Tramways ran to both the mill and the waste rock piles and were often pulled by animals or small locomotives (CALTRANS 2008:104) (Figure 40). In Georgia, hard-rock gold mining operations often used sluices to carry the water-excavated material from the mine area to the mill, with the sluice emptying at feeder bins for the stampers. In the twentieth century, mines and quarries utilized dump trucks and sometimes conveyors to carry excavated materials from place to place from the mine.

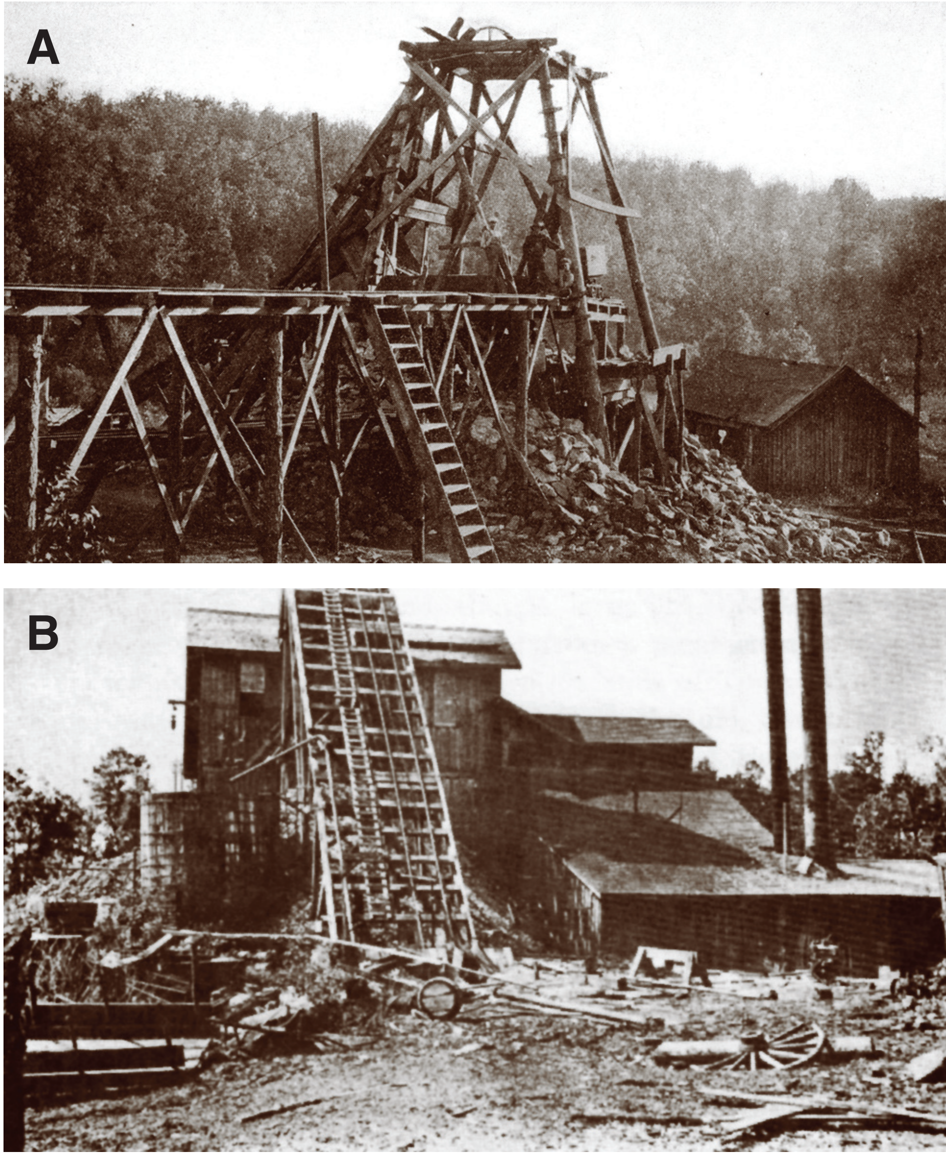


Figure 39. Hoisting from the mine

A) Typical headframe structure with pulley at top. Little Bob Pyrite Mine, Paulding County (Source: Shearer and Hull 1918).

B) Variant hoisting system: the ladder-like structure acted as a ramp to haul ore cars from the inclined shaft (open at ground surface) to the upper floor of the mill. Columbia Gold Mine, McDuffie County (Source: Jones 1909).

Figure 40. Various methods were used to convey the ore from the mine to the mill.

A) Coal miners with ore cars outside the mines. Kensington Iron and Coal Company property, Walker County (Source: McCallie 1908)

B) Horse-pulled carts. Brown Iron Ore Mine, Conley property, Fannin County (Source: Haseltine 1924)

C) Dinkie used to pull ore care from shale pit. Plainville Brick Company, Gordon County (Source: Smith 1931).

D) Elevated railroad for delivering ore from the mine to the mill. Royal Gold Mine, Haralson County. (Source: Yeates et al. 1896)

BENEFICIATION: PROCESSING RAW ORE AND MINERALS

Minerals taken from mines are in various states of purity and are sometimes excessively bulky. To improve their quality and value miners put the ores through a process called "beneficiation," which involves separating valuable minerals from the worthless component of an ore and concentrating the valuable product into smaller bulk and weight by discarding as much of the waste as possible (Richards 1909:1; Allen 1920:4). The ores go through a number of actions to regulate the size of the desired product (comminution), remove unwanted constituents (concentration), and improve the purity or assay grade of the desired product (refinement). At Georgia mining operations, most ores were shipped prior to refining them. The specific steps a particular ore goes through depend on the material being extracted, how easily it can be separated from its rock matrix, and whether it is in complex metal compounds (Thrush 1968; Noble and Spude 1992:11; Hardesty 2010:64).

Importantly, the processes described below did not necessarily come together in a single progression to convert rock to refined product. For example, ores might not pass through each procedure described below, or they might go through crushing and sorting with different sizes returned for additional crushing or sent in different directions for separate concentrating procedures. Moreover, they might pass through more than one concentrating procedure in an effort to fully extract the valuable ore. The following descriptions describe general procedures for handling ores, but individual ores mined in Georgia would not necessarily have passed through each process or in the order described here. Specific ores from Georgia are discussed following the general description to illustrate these points.

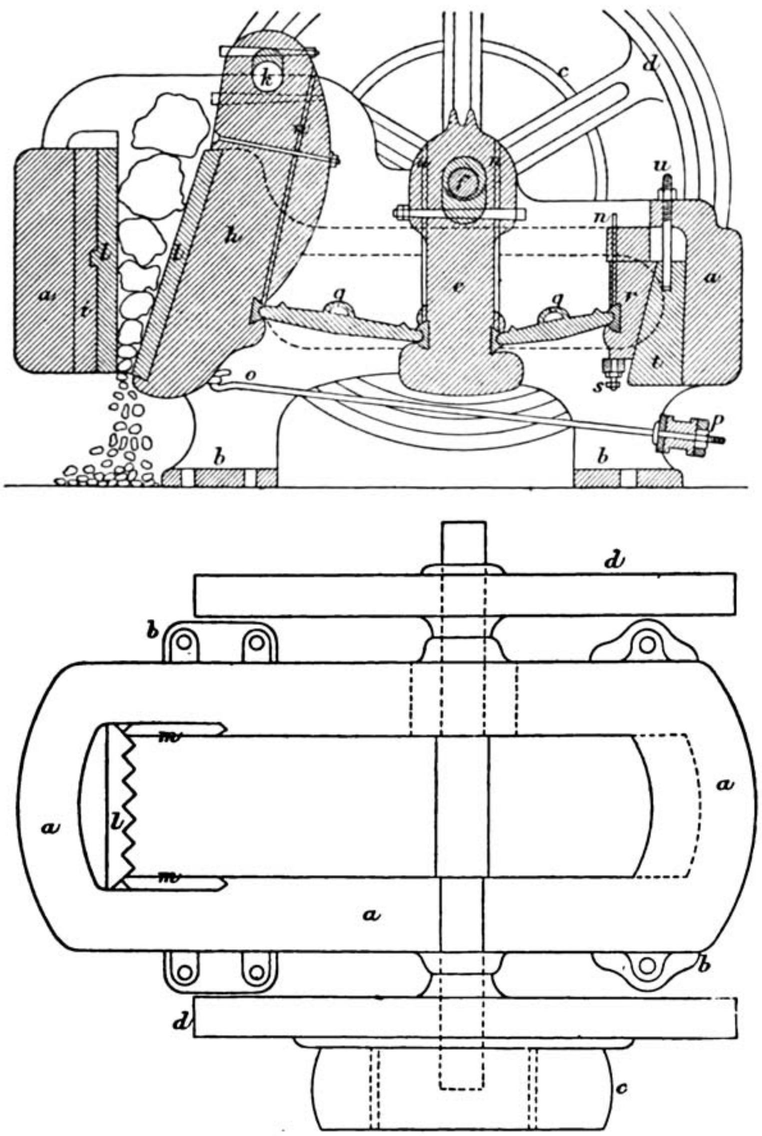
Breaking and Crushing

The first step in the process, called "comminution" (Thrush 1968), involved regulating the size of the ore. Usually this required reducing its size, but the process also produced particles of uniform dimension for subsequent treatment. Crushing and grinding turned out a product the size of coarse sand or even smaller ("slime") that was ready for milling, smelting, or to be sold in the crushed state (International Library of Technology 1902:25.1).

Comminution was subdivided into preliminary breaking and final crushing. Preliminary breaking reduced the ore fragments to sizes appropriate for the crushing machines and/or enhanced their friability. Methods included blasting in the mine, calcining by fire, hand hammers, steam hammers, drop hammers, and rock breakers. Blasting and hand hammering are two methods that are self-explanatory. Steam hammers operated on a similar principle as a forge hammer while drop hammers were similar to pile drivers. Other devices included jaw breakers, consisting of hinged crushers that operated intermittently as the jaws opened and closed, and spindle or gyrating crushers that operated continuously, breaking up rock as it was fed from the ore bins (International Library of Technology 1902; Richards 1909; Hardesty 2010:67) (Figure 41). Jaw- and gyratory crushers were commonly used in Georgia mining operations to produce coarse sand or gravel-sized fragments.

Final crushing freed the grains of valuable ore from the waste and prepared them for concentration (Richards 1909:9, 45). This process used varieties of stamps, rollers, and grinders. In Georgia, gravity stamps were the most common method for processing gold ore. Gravity stamps, operated by water, steam, or other power sources, worked by having a battery of heavy weights lifted by cams drop on the ore and breaking it against a mortar. As the ore was crushed to the appropriate size, it washed out of the stamp through screens and the across amalgamation tables, where the gold bonded to mercury (Figure 42). This equipment was commonly used in Georgia from the 1830s to the early 1900s (Louis 1902; Richards 1909:104-106; Williams 1993:72-73) (Figure 43).

Figure 41. Profile and plan of a jaw crusher (Source: Lock 1901).



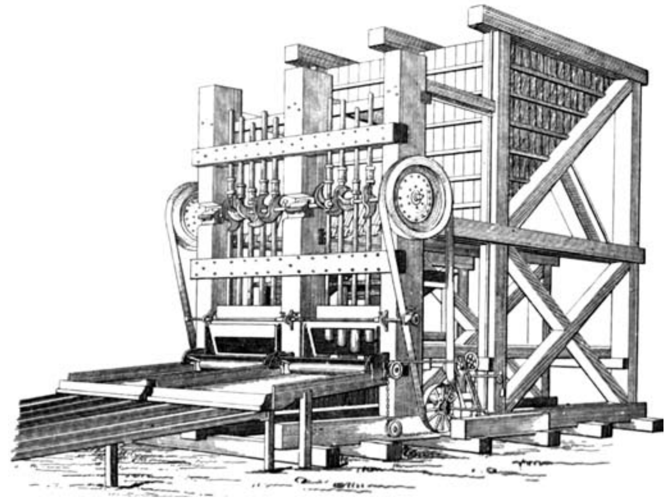


Figure 42. Stamp Battery with amalgamation tables (Source: Louis 1902)

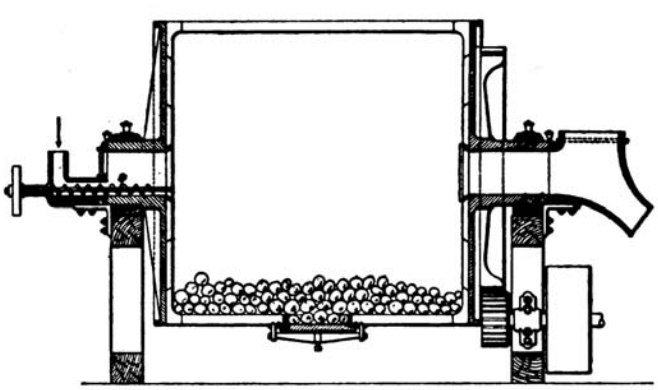
Another type of crusher used for gold was the arrastra (or arrastre), an early type of device that was common in South America and the western United States. The device consisted of a circular rock-lined pit in which the ore was crushed by stones rotating around the pit by turning a central pillar (Thrush 1968; Hardesty 2010:65). Yeates et al. (1894:315) mentioned them being used in Georgia but it is not clear how common they were.

Other ores were sent through a variety of grinding pans, tube and ball mills, roller mills, and pulverizers. These produced extremely fine “slimes” from which very small metal particles could be recovered from low-grade ores (Hardesty 2010:69). Slimes were so fine that water could carry them in suspension and they required separate treatment methods than the coarser sands (Hayward 1952:5; Thrush 1968). The equipment used to produce them was also best for softer minerals such as phosphates, asbestos, cement, and talc. Machines that produced slimes (“slimers” [Thrush 1968]) worked on various principles. Grinding pans had a heavy steel disc bear down on the ore as it rotated above a fixed plate. Tube and ball mills were cylindrical containers that rotated horizontally with the ore inside along

Figure 43. Battery and amalgamation tables inside the Parks Gold Mine stamp mill, McDuffie County (Source: Jones 1909).

with stone or steel balls or rods, which broke down the ore. As ore achieved the desired size, it exited the mill through screens (Richards 1909; Hardesty 2010:69) (Figure 44). Pulverizers included swing hammer types that crushed the ores with beater arms spinning through a metal rack. The machine discharged the ore as it broke into pieces small enough to pass through a screen. These were best for materials ranging in hardness from bone to granite and that came apart in shreds like bark or asbestos. Finally, crushers included varieties that had a vertically suspended roller rotate around the inside of a die ring (Richards 1909:161, 163). There

Figure 44. Cross-section of a ball mill (Source: International Library of Technology 1902).



were numerous variations and improvements on all of these devices, but as noted, their purpose was to produce fine-grained material that was subjected to the next stages of beneficiation.

Classifying

Classifying or sizing was a step related to, and sometimes mixed with, the crushing process. Ores were sorted into increasingly smaller sizes as they moved through beneficiation, with ores of appropriate sizes for the next step moving forward and pieces too large being fed back for further breaking and crushing. This was a preliminary step before the ore could be concentrated or readily separated into useful and waste products (Richards 1909:201). The process rendered a series of crushed ores of approximately the same dimensions for subsequent treatment that required uniform particle sizes. In addition, it was necessary to sort the ore as it was broken because mixing of different sized grains had the potential to clog or jam machinery intended for certain sized materials (International Library of Technology 1902:26.1). Classifying was accomplished with a variety of grates and screens as well as hand methods.

Hand picking or sorting, as the name implies, involved manually separating rich ores from rock that was already the desired size, thus saving the valuable minerals from going through the crushing process unnecessarily. It also reduced the amount of waste rock that went through dressing and shipping. This technique was particularly useful in situations where the mining process yielded high proportions of the country rock along with the valuable ore. Hand picking took place after preliminary breaking, although sometimes the ore was hand-broken and sorted in one step, a process called "cobbing" (Richards 1909:192-193).

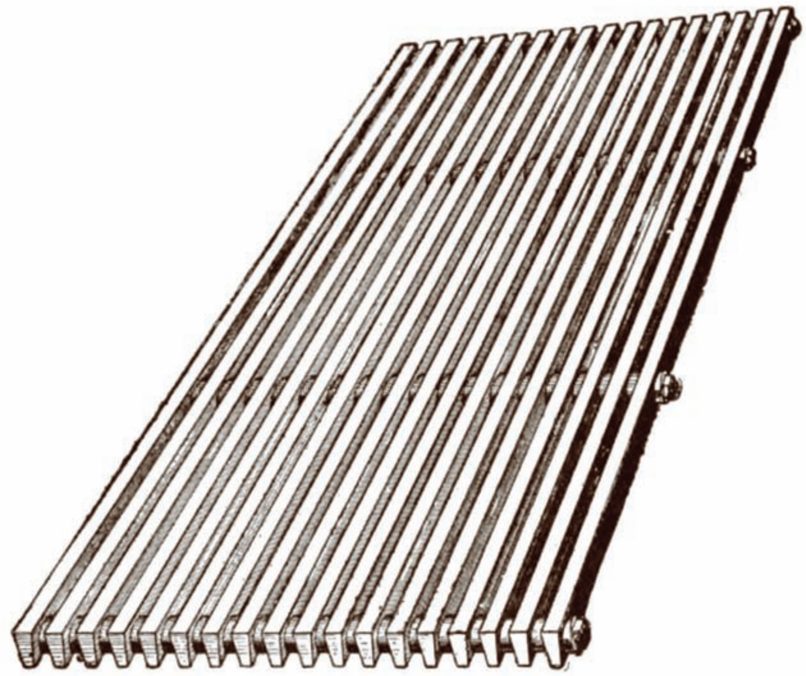


Figure 45. Grizzly (Source: Richards 1909).

Semi-mechanical methods of classifying by size began with the “grizzly,” a rack used to classify coarsely broken or unbroken ore (Figure 45). These were arranged to allow the smaller ore pieces to go directly to the ore bin for the next stage of crushing while the larger pieces were sent to the rock breaker or another area for hand breaking or picking (Richards 1909:194; Allen 1920:65; Hardesty 2010:69). Grizzlies were usually stationary and set at an angle to allow the large pieces or “oversize” to slide down and away while the “undersize” passed through (Richards 1909:201) (Figure 46).

Mechanical sorters included shaking screens, revolving screens, and belt screens. Shaking screens, or “riddles” essentially performed the same work as a grizzly but because their movement worked the undersize through, they did not have to be set at an angle. Revolving screens mainly consisted of “trommels,” which were revolving cylindrical screens that rotated on horizontal axis. As the machine turned, the undersize dropped through the screen into a casing and out through a spout, while the oversize emerged from the cylinder end and exited through a separate spout (Figure 47). These could be used in succession to sort the ore into several sizes (Richards 1909:209-210; Allen 1920:65-68; Thrush 1968) (Figure 48). Many Georgia mines used these devices.

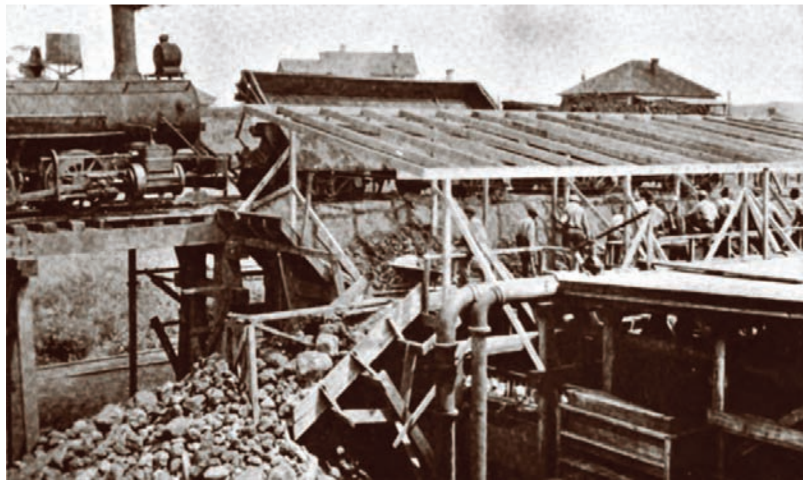
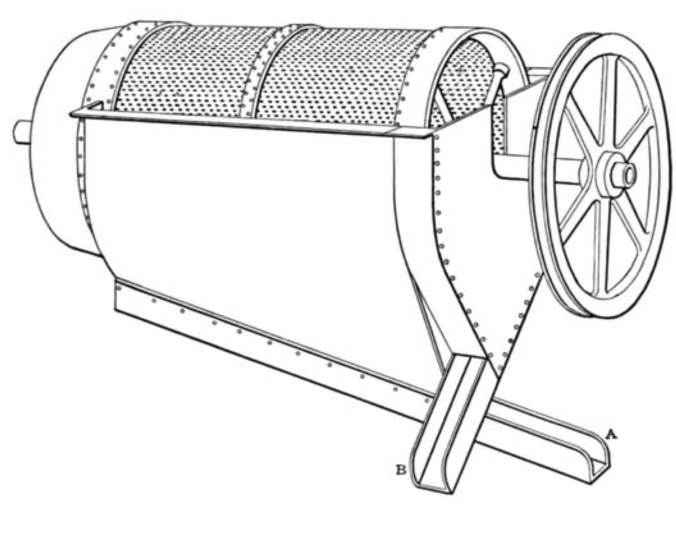


Figure 46. Manganese ore being dumped from tram cars onto grizzlies. The oversize is shifted to a separate area at left. Georgia Iron and Coal Company Aubrey Plant, Bartow County (Source: Hull et al. 1920).

Belt screens consisted of screens that traveled over rollers. Roughly crushed ore was loaded at one end and as the screen rolled forward, water sprays and shakers helped the undersize fall through the screen into a bin while the oversize rolled off the end into a separate bin (Richards 1909:217; Allen 1920:72).

Figure 47. Trommel for sorting ore by size (Source: Richards 1909).



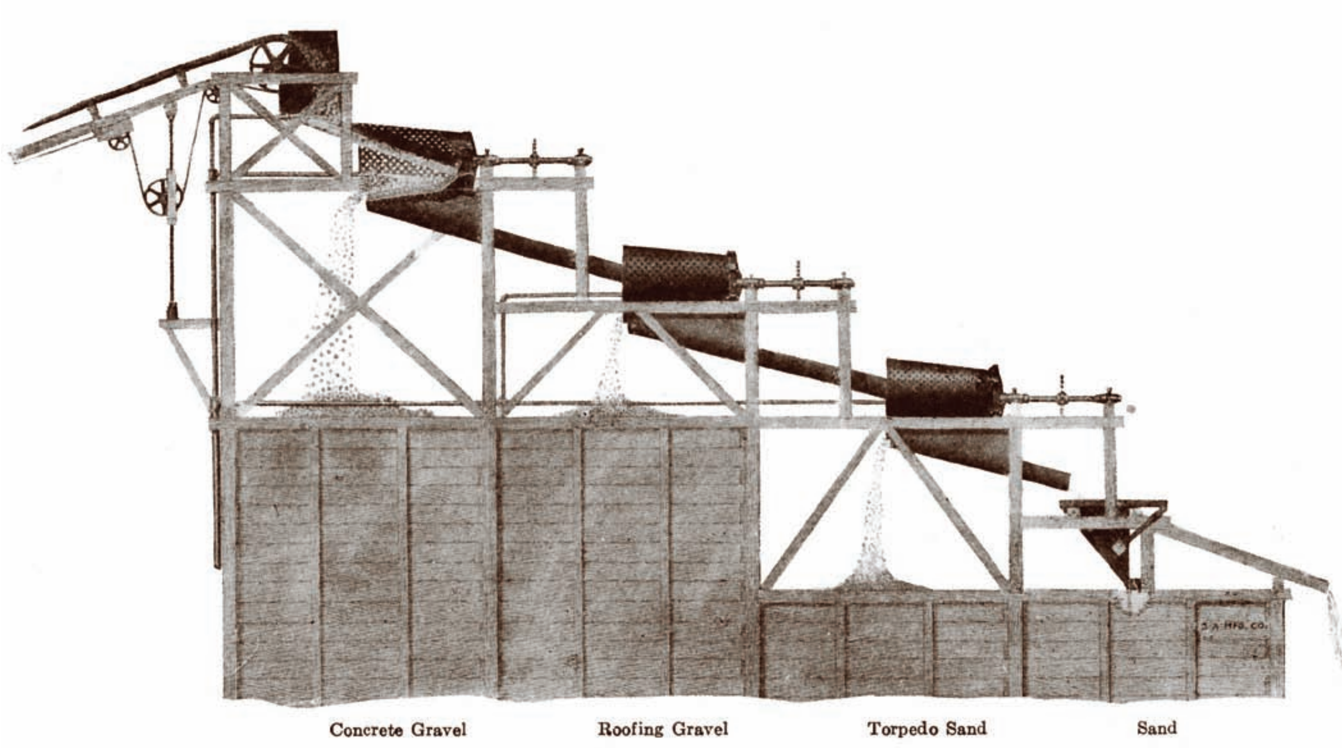


Figure 48. Trommels arranged in succession for sorting gravel, Stephens-Adamson Company, Georgia (Source: Teas 1921).

Water classifiers operated on the principle of separating ore particles on the basis of their different specific gravities. Devices used for this method suspended the ore in water and allowed them to settle. Jigs were a common type of equipment used for this process and produced classified material that was usually treated as final concentrates (see concentrating below) rather than being sent for additional processing. For this reason, jigs, although they acted as classifiers, were usually considered concentrators (International Library of Technology 1902:26.17; Richards 1909:219).

Washing

Washing comprised another beneficiation step and could take place alone or in combination with other steps. The goal of washing was to remove clay or other fine material adhering to the coarser materials. Some washing processes separated these materials and delivered a clean product while others simply loosened them, requiring further steps to separate the fine and coarse materials. Washer types included trough washers, log washers, wash trommels, and washing pans. These functioned by applying copious amounts of running water to the ore and agitating the mixture with a stirring device. Washers could be classified into types using hand tools for stirring, those using some form of power-driven rotating stirrers, and those relying on the force of a water jet (Richards 1909:183). Certain of the ores mined in Georgia were handled with washers either as a part of the beneficiation process or as the only step taken before shipping.

The trough washer or "trunking table" was an example of washers that used hand tools to function. This device consisted of a wooden or metal-lined trough placed at a slight incline. Ore was loaded at one end and water was poured in at the other. The ore was worked against the flow with shovels to produce

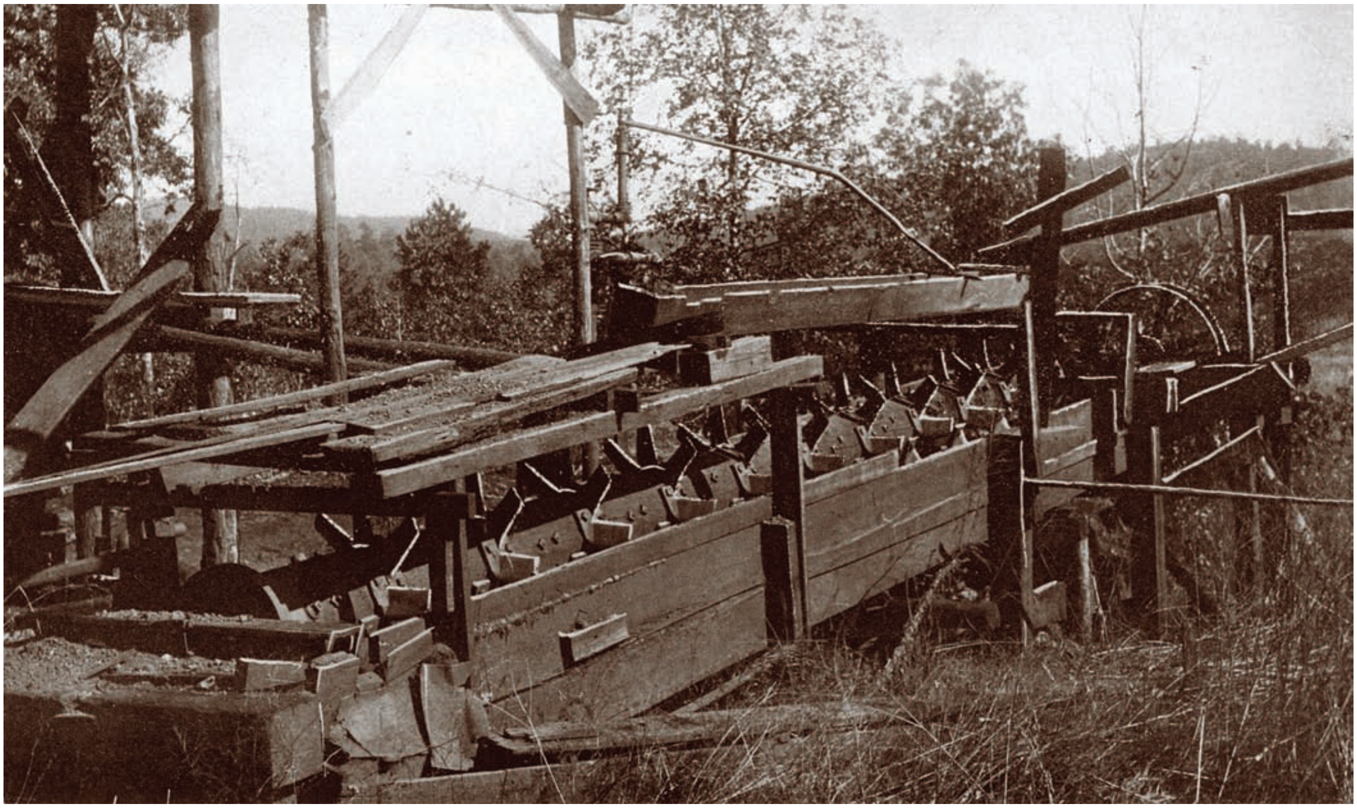


Figure 49. Log washers were commonly used in north Georgia mining operations and were often the only processing conducted. Manganese washer on the Milner-Harris Place, Bartow County (Source: Watson 1908).

three products: coarse sand left in the trough, fine sand in a tailings tank, and clayey waste. These simple devices were often used at small operations that did not warrant the expense of more elaborate equipment or might be used at a larger mine to supplement mechanical washers. Trough washers could also be upgraded with mechanical stirring using a bladed shaft, which would increase capacity (Richards 1909:183-184).

Log washers or "trunking machines" were a mechanical upgrade of the trough washer consisting of a similar container but with agitation provided by an interior shaft. The shaft, of thick wood (originally a log), cast or wrought iron, or steel, had blades attached at oblique angles to form a screw conveyor that worked the ore against the water and discharged them at the upper end while the waste floated away to the bottom (Richards 1909:184-185) (Figures 49 and 50).

Wash trommels were enclosed revolving cylinders that provided agitation as the lumps of ore impacted each other and sometimes blades attached to the interior sides of the washer. The blades were at oblique angles to move the ore forward while the water flowed in the opposite direction. A variation on flowing water through the trommel was to immerse it while it turned (Richards 1909:188).

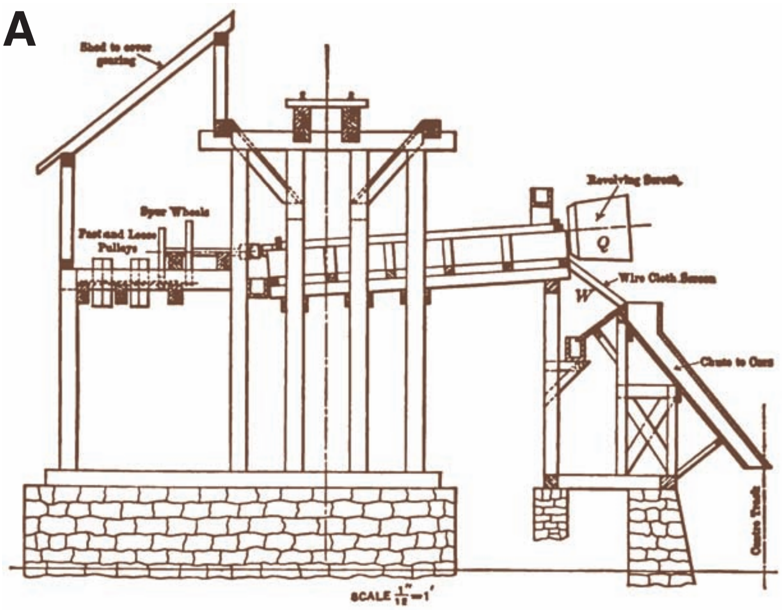
Other types of washers do not appear to have been common in Georgia, if they were used at all. Washing pans were circular tubs that cleaned by having revolving blades, rods, or rollers and scrapers agitate the water and ore mixture. The lighter clay and sand washed out with the overflow at the top of the device while the ore sank to the bottom. This equipment was sometimes used for corundum and emery (Richards 1909:191). Finally, hydraulic giants used the same technology described for gold mining. Although Richards (1909:192) classified this technology as a washing method, the separation of rock from clay actually took place during extraction at the mine.

Figure 50. Log washer installation

A) Side elevation of a log washer showing the associated structure and equipment (Source: Richards 1909).

B) Washing plants could be large and elaborate structures. The plant of the Nulsen Mine, Bartow County, had double washers (Source: Hull 1920).

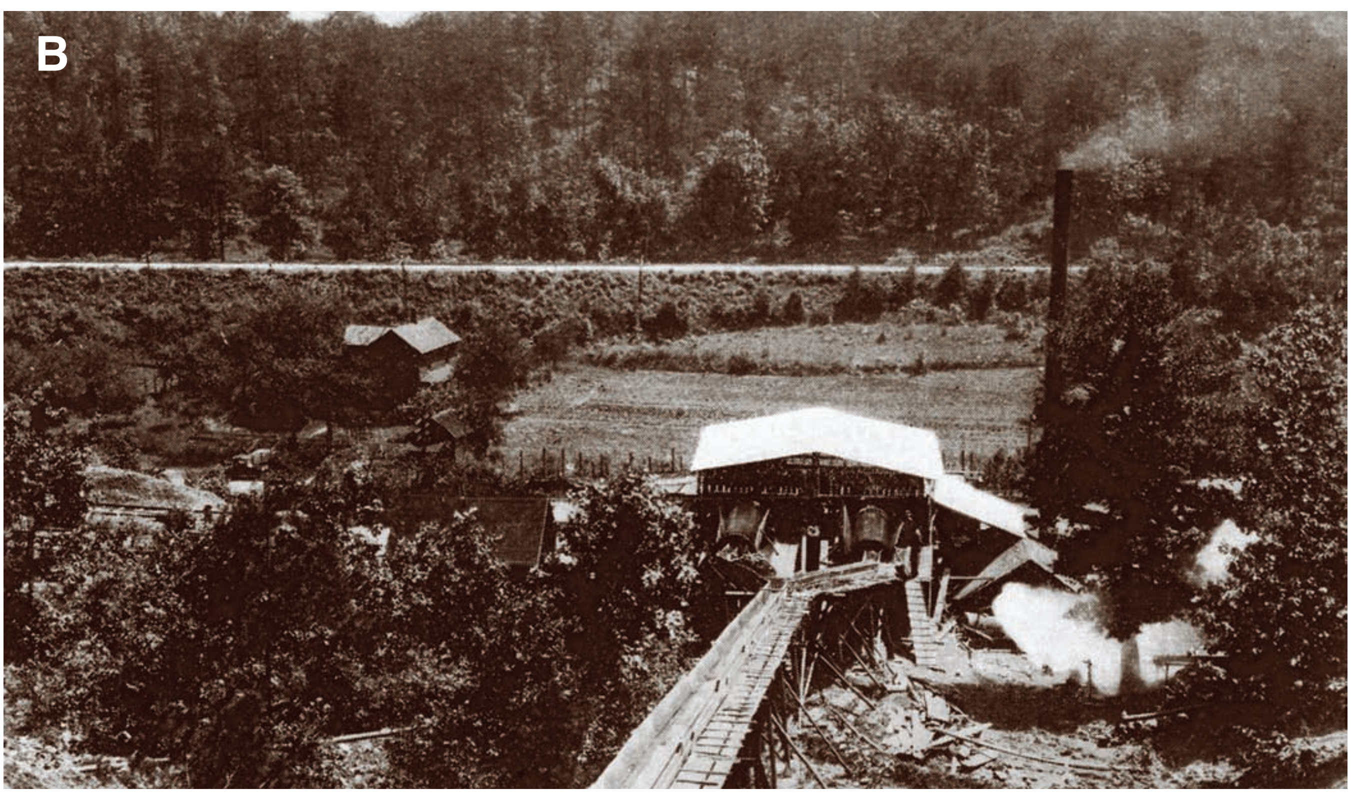
A



Concentrating

Concentrating involved removing waste rock to increase the proportion of desired minerals in the crushed and sorted ores. The process relied on specific gravity and reduced the bulk of the ore, making it cheaper to ship, smelt, or handle in general (International Library of Technology 1902:26.21; Richards 1909; Thrush 1968). Simple methods for concentrating included hand picking, panning, and hand-powered equipment. Machines used for the process, known as “concentrators,” were divided into two general categories. The first of these performed the separation using intermittent upward currents of water, which sorted the minerals into layers. Jigs were the primary type in this group. The second class relied on the ability of heavier

B



particles to cling to a smooth surface against the force of a stream of water and included belt and table concentrators (International Library of Technology 1902:26.22). Which machines were used depended on the specific minerals involved, their individual properties, and the preliminary treatments that had taken place already.

The simplest method of concentration was hand picking or panning, which was used in early Georgia gold mining. It was not an economical procedure for handling large amounts of material or for minerals too fine to remove, such as minute gold flakes (Hayward 1952:3). Gold miners in Georgia also used a variety of other devices for concentrating, most being relatively simple and hand-operated. These included cradle rockers, consisting of wooden troughs mounted on wooden rockers into which the gold-bearing ore was loaded along with water. Rocking the device agitated the mix and caused the lighter material to wash out over rim of the trough. An improved version had an upper tier with screen bottom and an open end on the lower portion. Placer deposits were shoveled into the top rack and as water was poured over it, smaller materials, including gold flakes, washed through the screen. Riffles attached to the lower tier caught the heavier gold particles while the lighter waste washed out the open end (Gregory 1907:7; Richards 1909:323; Williams 1993:66-67) (Figure 51). These devices were intended to increase the speed of processing but did not substantially increase the recovery of small particles. In addition, in the case of placer mining, no preliminary breaking or crushing was performed. These methods mainly captured relatively pure gold mixed with non-valuable gravel and sand.

Stationary concentrating tables were another simple type of device, and consisted of long, narrow tables with riffles or channels built on the surface. To concentrate the ore, crushed minerals and water were washed across the table. The uneven bottom of the device agitated the flow and allowed the heavier materials to settle into the pockets between riffles while lighter materials washed out. These devices could be used alone as the only method of concentrating or in combination with other methods and devices (Richards 1909:319).

Jigging was a process of separating based on differences in specific gravities of particular minerals. Jigs functioned by placing mixed minerals in a box with a screen bottom, suspending the box in water, and forcing the water up and down through the minerals (Figure 52). Jigs fell into two types, the first with a movable screen that pushed up and down

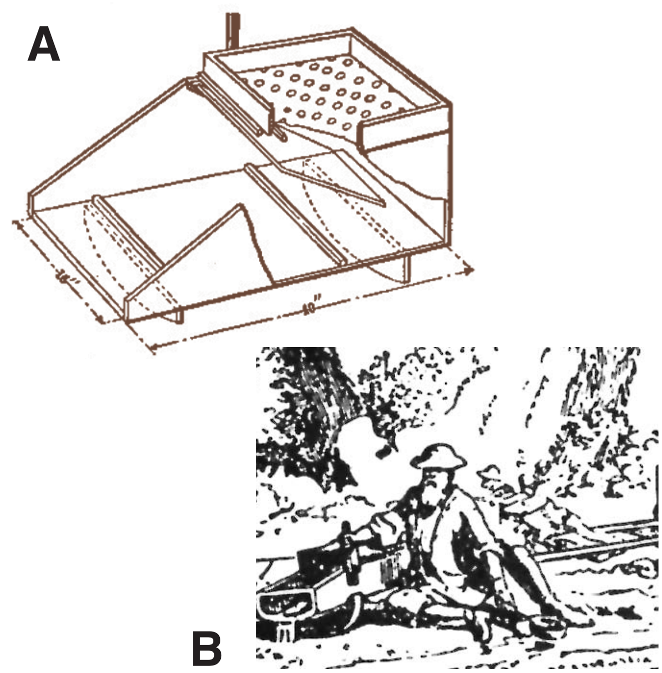


Figure 51. Cradle rockers were one tool used to concentrate gold.

A) Diagram of a cradle rocker (Source: Richards 1909).

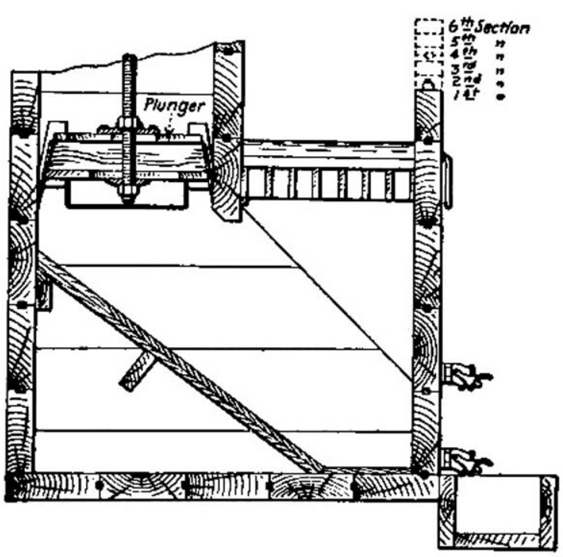
B) Placer mining using a cradle rocker (Source: Rickard 1932).

in the water and the second having a stationary screen and a separate plunger that created an up and down current in the water. This action sorted the minerals into layers for separation (Richards 1909:277; Hayward 1952:6).

Other devices included separators with moving parts, such as bumping tables. The main difference between these and a stationary table was that the bumping table could be oscillated back and forth. As with the stationary table, the heavier minerals fell into the pockets between the riffles. The oscillation of the bumping table, however, caused the heavier material to move toward one end of the table while the lighter minerals washed off the lower edge (International Library of Technology 1902:27.2; Hayward 1952:7; Hardesty 2010:72).

Finally, belt concentrators or "vanners" comprised continuous feed and discharge systems in which the separation took place on the upper surface of a slightly inclined belt. As with other methods, these worked by providing mild agitation to keep particles of the lighter mineral in suspension while allowing heavier particles to sink. Mixed ore and water was fed onto the lower end of the belt, while wash water entered the upper end. At the same time, the belt was shaken to help stratify the material. As the belt moved upward, the heavier ores settled into the belt to be dropped off at the head while the lighter mineral washed off the low end (International Library of Technology 1902:27.5-6; Richards 1909:350; Hardesty 2010:71).

Figure 52. Cross section of a jig showing the plunger to agitate water and the screen box to the right of it (Source: Wiard 1915).



Various other methods and equipment were used for concentrating, but these were used only to a limited extent in Georgia mining operations, if at all. Methods included flotation, magnetic separation, and chemical methods, including chlorination and cyanide leaching. Among these, only chemical processes were definitely used in Georgia, particularly for gold mining, but at just a few mines during the first decades of the twentieth century. Chemical methods were useful for extracting more complex metallic compounds or for handling minerals that were difficult to break loose and separate from the ore with mechanical processes. Chlorination involved first roasting the ores to oxidize the base metals and then exposing them to chlorine gas to produce chloride of gold. The gold was then precipitated from the compound. The cyanide process involved dissolving the gold and silver in the crushed ore with a cyanide compound and then precipitating the precious metal with zinc or other means before refining it (Thrush 1968; Hardesty 2010:79-80, 83-84). The advent of these methods had implications for the kind of ore mined (sulfides could be used), as well as requiring the use of highly trained professional mining engineers. Further, because they required finely ground ores, these methods brought about new developments in crushing technology. Chemical processes were also more expensive and so required greater initial investments and higher returns to be profitable (Hardesty 2010:73).

Amalgamation

Amalgamation was a process for extracting gold and silver that was widely used in Georgia hard-rock gold mining operations. The process operated on the principle that mercury dissolves gold at ordinary temperatures and forms an amalgam. The method was used for placer deposits by adding the mercury to the riffles used in rockers or other devices to increase the recovery rate of loose gold particles. For lode mining, amalgamation was used mostly in conjunction with stamp mills (see "Gold" below).

Smelting

Smelting represents another step in beneficiation that applies to certain minerals, particularly lead, copper, or iron compounds, which are difficult to separate (Noble and Spude 1992:12; Hardesty 2010:104). Smelters may process high-grade ore directly from a mine or the concentrated material from a mill, in which case the smelting process then comprises a part of the concentration process (Noble and Spude 1992:12). The objective of smelting is to separate metals from impurities to which it may be chemically combined or physically mixed through fusion (Thrush 1968). The process may produce either an upgraded ore or fused sulfide known as matte or a crude metal that requires further processing through refining (Hayward 1952:14; Noble and Spude 1992:12; Hardesty 2010:104). So far as is known, iron was the only metal Georgia produced that was also smelted in the state.

Early smelting involved heating ore on small hearths with a charcoal fire, blown by bellows or hand pumps, that converted the ore into solid iron and slag (consisting of the impurities in the ore). Both iron and slag came off the hearth mixed together in a single mass called a "bloom." The smelter took the bloom from the hearth and hammered it to consolidate the iron and drive out the slag (Gordon 1996:14). These early operations were small scale and usually operated near the mine (Noble and Spude 1992:12).

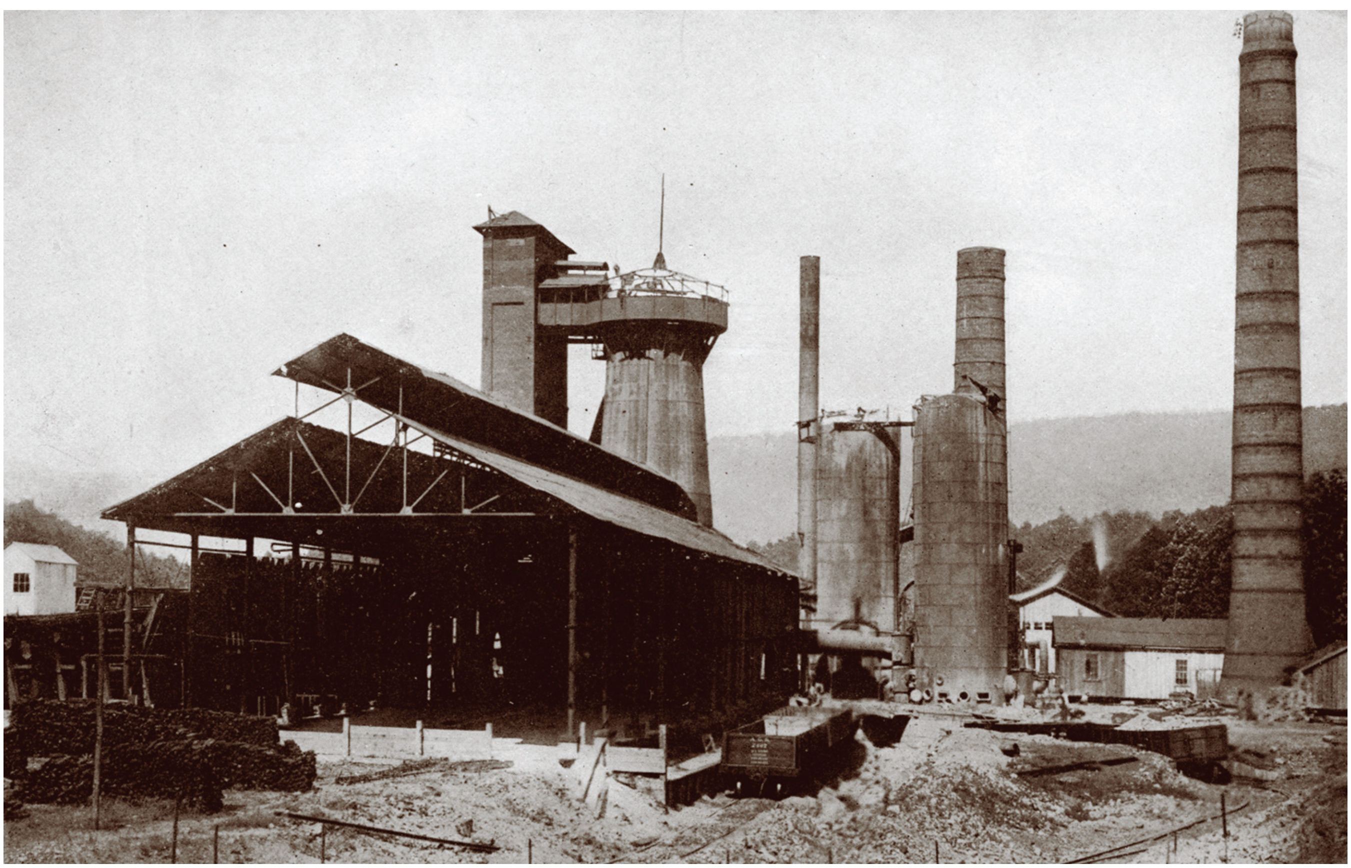
By the nineteenth century, iron smelting was performed in blast furnaces. Smelters fed ore, fuel, and flux into these massive masonry structures. Granite and sandstone were preferred building materials and the furnaces were truncated pyramids in shape, typically 30-35 feet high. The furnaces were constructed on four pillars that provided four openings: three tuyere arches where bellows were placed and a working arch through which the molten iron was removed. The interior of the furnace featured a hearth and forge made of brick or sandstone that was known as a bosch. As the furnace operated, liquid iron accumulated in a crucible at the bottom where it could be tapped. Molten iron came out of the working arch into trenches dug in the ground that were referred to as sows. The liquid iron cooled and hardened in these trenches, and when removed was referred to as pig iron. A smelting operation on this scale also required sources of waterpower to operate the bellows as well as access to supplies of fuel, flux, and building materials (Joseph et al. 2004:129; Gordon 1996:14). Moreover, improved capabilities for transporting ore allowed blast furnaces to be located at a distance from the mines (Noble and Spude 1992:12), and thus altered the settlement patterns associated with this industry (Figure 53).

Beneficiation in Practice

In summary, beneficiation involved a sequence of steps that ore proceeded through between the mine and the refinery or other finishing processes. The general progression involved breaking up and crushing the ore to reduce the particle size ("comminution") and detach the valuable mineral from the waste; sorting the crushed ore (or "pulp") into size categories ("classification"); and removing the waste from the valuable product ("concentrating"). These steps could be accomplished with a variety of hand and mechanical methods. They were carried out in structures referred to as mills and concentration plants. The products leaving the plants consisted of substances ready for refineries or other finishing processes, or could be saleable commodities requiring no further reduction.

The preceding descriptions of each beneficiation operation and related equipment indicates a general practice. However, in reconstructing how an individual mining property operated, it is important to note that there were numerous ways of implementing the process that combined steps and equipment in various ways. Differences in how the process was conducted might reflect the particular mineral, its intended market, and the preference or skill of specific mine operators. For instance, hard-rock gold mining typically proceeded by sending the ore from the mine to the stamp mill to amalgamation (concentrating). Some classifying took place as the ore left the stamp mill through a screen, but in general, this process did not involve a formal size classification step with dedicated equipment and classifying areas of the plant. Also, the extraction and conveying procedures used in Georgia (referred to as the "Dahlonega Method") omitted crushing because the particles delivered to the mill were already small enough for stamping (Nitze and Wilkens 1896:745). Moreover, the waste leaving

Figure 53. A modern (circa 1906) blast furnace built of cement and serviced with a mechanical elevator. Rising Fawn Furnace, Dade County (Source: McCallie 1908).



the amalgamation tables might proceed through one or more additional concentrating steps to ensure that as much of the mineral was removed as possible before the tailings were discarded.

Furthermore, the ore did not necessarily proceed in a single stream through the mill and concentrating plants. As noted above, materials were often fed through a grizzly, with particles of the desired size (the "undersize") going in one direction and larger fragments ("oversize") going in another for picking and breaking. Similarly, fragments that were too large after passing through one process would be returned for additional size reduction. In addition, because certain concentrating methods were better for sands and slimes, these two products of classifying might be sent in different directions for separate processing.

The point to make here is that in reconstructing the operations at particular mines, mills, and plants, researchers must consider a wide range of possible configurations. Some of these are suggested by Georgia Geological Survey bulletins of the late nineteenth and twentieth centuries. As Hardesty (2010:29) cautioned, however, these kinds of references described basic processes and equipment used for mining but did not always indicate what miners actually did. Study of particular mining operations would provide important information about the development and practices of Georgia mining.

Specific Minerals

The preceding overview described general practices and technologies used for mining and concentrating metallic and nonmetallic ores. To provide clarification and guidance in dealing with particular types of mines and related cultural resources, the following sections review techniques and processes of mining selected Georgia minerals. The specific minerals described in the following sections constitute the most important minerals, those most likely to be encountered archaeologically, and/or examples of minerals that had special handling techniques. These sections also illustrate how miners in Georgia arranged some of the general methods and technologies described previously.

Gold

Of the mineral industries in Georgia, gold was one of the longest-lived and most varied in how it was acquired. Gold was mostly mined from placers in valleys (miners called these "deposits"), older placers in valley walls and ridges ("surfaces"), and in quartz veins (Williams 1993). In addition, gold was distributed as loose particles and within quartz gravel throughout the clayey saprolite (Wilson 1934:3). The deposits that miners worked most frequently and the techniques used to acquire the gold changed over time. During the gold rush era, miners mostly worked placers and extracted the gold with various hand picking methods. Later, quartz gravel and lode deposits were excavated with hydraulic systems and hard rock mining methods, and the gold was extracted from the waste rock mainly with amalgamation.

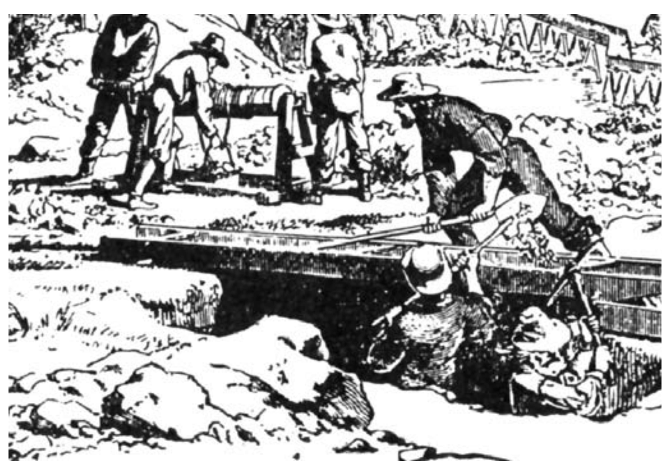
Hand picking was a simple form of concentration and included panning, the characteristic technique of the individual gold miner (Figure 54). Miners also used the technique to check soil samples while prospecting. Among the more elaborate methods in use at this time were various devices such as cradle rockers that essentially replicated panning but processed larger volumes. Another device was the sluice box or "rippler," consisting of a long flume with riffle bars on the bottom. Miners shoveled dirt into the flume while a continuous stream of water washed out the lighter particles and left the heavier ones caught in the riffles (Gregory 1907:7; Richards 1909:323; Williams 1993:66-67). Variations included adding baskets to trap the largest gravel particles before the finer materials entered the rocker (Williams 1993:67).

The "long tom" was a well-known apparatus that worked like a rocker but was considered more efficient. It consisted of a trough about 12 feet long and 20 inches wide, with a perforated metal plate, the "riddle" covering the outlet end. Sand and finer materials washed through the riddle into a riffle box that caught the gold particles as finer materials ran out (Figure 55). An improved version had two levels, with the floor of the upper tier being a sieve. Water poured continuously through the device. As one miner shoveled gravel and sand into the upper level, a second miner agitated the mixture with a hoe or rake. As the finer materials washed through the lower tier, riffles captured the heavier gold particles. A version with rockers to facilitate agitation was the "gum rocker." The effectiveness of the riffles was sometimes improved by coating them with mercury to form an amalgam (Gregory 1907:7; Williams 1993:67-68; Franzius 1997).

Figure 54. Panning was a simple method for separating free gold from waste rock and checking soils while prospecting (Source: Rickard 1932).

During the gold rush era, efforts were also made to mine placers from the river bottoms. Miners began using flatboats in 1833 to dredge sand and gravel deposits from the Chestatee and Etowah rivers. These early ventures typically involved two men using a boat between eight and 10 feet long and taking the dredge spoil ashore to hand-process (Williams 1993:69). At the end of the nineteenth century, some operators put larger boats into the rivers equipped with mechanical dredges and floating sluices that processed the ore as it was dredged. In all, only about a dozen of these larger boats operated during the last 20 years of the nineteenth century, and mostly on the Chestatee River (Brewer 1896:579; Yeates et al. 1896:525-526). The Georgia Archaeological Society (2008) reported the wreck of one of these vessels on the Chestatee.

Figure 55. Gold miners working with a long tom (Source: Rickard 1932).



These various methods were intended to improve on panning, which could only yield minor profits because it could only process small volumes of material (Crickmay 1933:3). While they increased the quantity of ore processed, they also caused changes in the organization of labor by requiring the cooperation of two or more miners and, therefore, gave rise to mining partnerships (Franzius 1997).

Other methods used to mine gold in Georgia focused on upland gravel deposits and hard rock. Hydraulic systems were used to excavate loose auriferous rocks in upland saprolite, colluvium, and alluvium. The system was introduced to the state after its development in the California gold fields and used extensively in Georgia until about 1900 (Crane 1908:313; Wilson 1934:3). It significantly changed the nature of gold mining in the state by requiring elaborate infrastructure, having a large footprint on the landscape, and requiring extensive water rights and easements.

Blake and Jackson (1859:11-12, 22) described the operation of the system during the nineteenth century. Water was tapped from the heads of streams and routed to the hilltops above the worksite through canals and ditch systems that sometimes extended for miles and involved extensive aqueducts. The drop in the height of water created enough pressure to jet it at an earthen bank, which collapsed and washed away. The water was directed using a swivel-mounted nozzle called a "hydraulic giant" or "hydraulic monitor." The washed out soils and gravel went through channels cut into the bedrock ("ground sluices") (Figure 56) or wooden conduits ("board sluices") (see Figure 10). As the gravel and soil deposits flowed through the sluice, the heavier gold particles became trapped in riffles or, if the ground sluice were cut into mica or slate bedrock, the gold was caught by the natural cleavages in

Figure 56. Ground sluice used for placer mining. Note the piles of discarded rock removed from the sluice. Coosa Creek Gold Mine, Union County (Source: Jones 1909).

the rock. The hydraulic system was notable for the enormous gashes and eroded landscapes it created as "square acres of earth on the hillsides [were] swept away into the hollows, without the aid of a pick or shovel in excavating" (Blake and Jackson 1859:12). Contemporary sources described these mines as nothing but immense ditches (Tenney 1853:629).

Georgia gold miners combined hydraulic systems with amalgamation to create a process that became so well established in the region that it was known as the "Dahlonega Method" after the center of the gold mining district in Lumpkin County (Nitze and Wilkens 1896:742). The process used hydraulic excavation to loosen the gold-bearing soils and gravel and wash them through sluices, where riffles caught a portion of the loose gold flakes. The sluices then delivered the gravel to the stamping mills where it was crushed and washed across the amalgamation tables. The Dahlonega Method also incorporated a technique known as "booming" (Hardesty 2010:36), which involved emptying a reservoir at the top of the work site, instead of using a water jet, to wash loosened saprolite and quartzite to the mill (Figure 57). A problem with hydraulic systems in Georgia was that they released considerable quantities of gold-bearing dirt into the nearest stream, making them inefficient in maximizing returns (Yeates et al. 1896:315-316; Wilson 1934:3). With greater capital outlays and operating expenses, they had to produce significant returns to be profitable. Wilson (1934) suggested that no effective means was found to maximize the collection of fine gold particles floating in the saprolite.

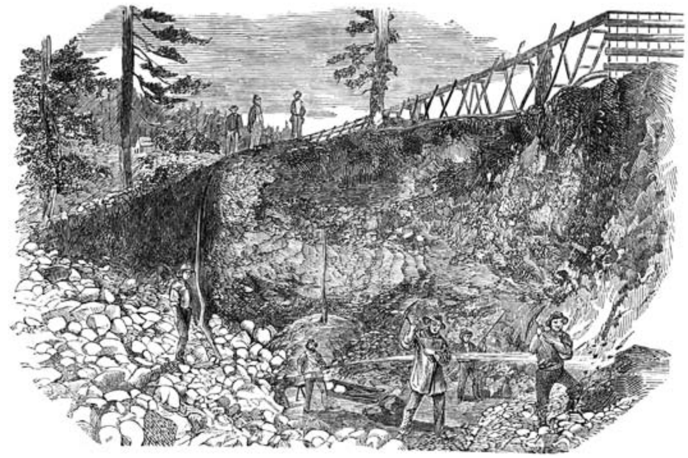


Figure 57. Aspects of the "Dahlonega Method" of gold mining. Note the aqueduct bringing water to the large storage tank above the workings (upper right). The rocky slope at left reflects an area already washed out to gravel (Source: Blake and Jackson 1859).

Georgia gold miners also worked hard rock sources. They began seriously prospecting these sources as early as the 1830s (Williams 1993), but lode mining only became prominent as placer deposits started playing out. At first, shallow veins or lodes were worked on a small scale with hand-dug pits, a procedure sometimes called "gophering" (Wilson 1934:3). As shallow deposits were worked out, it became necessary to construct shafts and tunnels to reach the lode ores. Typically, work stopped upon reaching the water table or sulfided ores that could not be handled with stamping mills and amalgamation (Jones 1909:15-17; Williams 1993).

Amalgamation was the most common method used to concentrate gold ores in Georgia between the mid-nineteenth and twentieth centuries. As noted previously, amalgamation took place in a stamp mill and involved using mercury-coated plates to bond with the gold particles. In a typical mill, the ore was fed to the battery of stamps and crushed. Amalgamation plates in front of the stamps caught the gold as it washed out of the stamp along with the waste rock, which washed off the tables (see Figures 42 and 43). In some instances, recovery was increased with the addition of mercury-covered splash plates inside the mortar (International Library of Technology 1902:28.14-15; Richards 1909:103-

106; MacFarren 1910; Hayward 1952:430-431). Workers removed the amalgam from the plates with rubber scrapers and squeezed out the excess free mercury in canvas or chamois cloth. The residue of this was distilled in a retort to separate the gold from the mercury, which could be reused (Hayward 1952:433). Amalgamation might be used in combination with other extraction methods. For example, amalgamation would remove the coarser gold particles while the tailings from this went through further concentration and then a chemical process (Clennell 1910:34).

Chemical concentrating methods were used by a few Georgia gold mines at the end of the nineteenth century and during the first decades of the twentieth century. The Franklin/Creighton mine in Cherokee County experimented with the cyanide process, using it to reprocess tailings from earlier operations, before switching to a chlorination plant during the 1890s (Nitze and Wilkins 1896:685, 759; Paris 2003b:195). This was the only chlorination plant to operate for any length of time in Georgia, although other mines experimented with the process (Crane 1908:71). Although it was not common, several mines in Georgia put in plants for the cyanide process (Paris 2003a, 2003b; Hebert 2006). In general, this process seems to have produced limited profits and most of the mines using it ceased operations by 1920 (Paris 2003a, 2003b).

Iron

Iron ores of commercial importance in Georgia consisted of varieties of limonite and hematite. Limonite, typically called "brown iron ore," included a number of hydrous iron oxide minerals. Hematite, known as "red iron ore," was found as oolitic and "fossil" types. In addition, sources of Clinton ore (known as "fossil iron ores" in Georgia) occurred in the northwestern corner of the state (McCallie 1908). In Georgia, limonite was mined to make iron while hematite was mostly used for pigments (McCallie 1900:9; Butts and Gildersleeve 1948:117). Economically valuable limonite was in residuum of calcareous rocks. In the Cartersville District, this matrix occurred in two varieties: a brown clay weathered from calcareous metashale and a light brown to white clay derived from moderately calcareous to noncalcareous metashale that retained its bedding (Kesler 1950:53-54). Deposits of brown ore were in both dense and irregular deposits in the residual clay as boulders, gravel, or lenticular bodies of limonite enclosed in weathered metashale (McCallie 1900:17-18; Kesler 1950:57). The ores usually were found on hill slopes closer to the foot of the slope and in small valleys and ravines (Peyton and Leweicki 1949:5). Clinton ore occurred in dolomite and limestone of the Ridge and Valley province (McCallie 1908).

Iron (brown) ore mining in north Georgia was conducted in open pits, mostly by hand methods until around the turn of the twentieth century, when steam shovels were put into use. Prior to the Civil War, mining took place in the vicinity of the blast furnaces, but after the war fewer blast furnaces remained in operation. By around 1900, most of the iron ore in Georgia was shipped to Tennessee and Alabama (McCallie 1900:27-28; Butts and Gildersleeve 1948:120; Gray 2003:249). Thus, earlier mines and beneficiation plants might be expected to occur near blast furnaces or forges, while later operations would not necessarily have these associations.

The residual clay or weathered shale that contained the iron ore exceeded it by volume and had to be removed to increase the percentage of valuable mineral. The only beneficiation conducted in Georgia, however, was to remove as much of the adhering clay and sand as possible before shipping. Typical procedures were to unload the ore onto a grizzly with bars 2.5-6 inches apart. Larger pieces were sledged or crushed by machine while the smaller pieces went into log washers. The clay was sluiced into mud ponds while the remaining material was discharged into revolving or vibrating screens to be sprayed with water jets. The ore and rock remaining on the screen were sent to picking belts for hand-removal of unwanted material. The picking belts discharged to loading bins for shipment (Kesler 1950:57-58). McCallie (1900:26) indicated that certain of these procedures would not necessarily have taken place, depending on the quality and density of the ore bank and the time period. Moreover, he noted that some mine operators experimented with calcining (burning) the ore to drive off water. Iron ore mine sites might therefore exhibit some variation in methods and organization.

Hematite was mined intermittently and mostly on a small scale (Butts and Gildersleeve 1948:121). It was mined from both open cuts and underground workings, underground sources becoming more common in the 1910s as outcrops played out. Underground methods were suitable chiefly where ore beds were of a size and quality to warrant the effort (Burchard 1913:47). The ore was hand cobbed to remove material with excessive quartz and shipped (Kesler 1950:60).

Clinton or fossil ores were mined by open pit and underground methods. McCallie (1908) described the deposits and properties that were being mined during the early twentieth century but did not provide information on techniques and systems of beneficiation.

Manganese

Manganese deposits in Georgia occurred in finely disseminated and concretionary forms in residual clays of carbonate rocks and in weathered calcareous metashale. Bodies of manganese-bearing clay mostly had irregular outlines but some occurred in sharp lenticular forms that miners called streaks. Streaks might be found in barren clay but were chiefly associated with large, irregular bodies of manganiferous clay that contained less manganese than the streaks. It also occurred as nodules and pebbles on the surface and through the zone of residual clay. Like iron ores, mining of this ore took place mainly on ridge flanks near the base of the slope as well as in small valleys and ravines (Peyton and Leweicki 1949:5; Kesler 1950:53). Commercial mining of manganese took place primarily in the northwestern part of the state and focused on black manganese oxides (Watson 1908:18; Butts and Gildersleeve 1948:138; Gray 2003:251).

Mining and concentrating manganese typically involved extraction, washing, and classifying the ore to a point where it could be shipped. Workable deposits were mostly on ridge slopes and crests. Loose pieces of “float” were sometimes used to identify potential outcrops, although these indicators were not entirely reliable (Watson 1908:28-29). Manganese extraction took place in underground mines on a limited scale, especially before World War I, but the majority of the manganese mined in the state came from open-pits (Kesler 1950:58). These methods were often used together where ores occurred near the surface but continued to an irregular depth. Underground workings were usually timbered (braced) because of the nature of the country rock, but reportedly this was done in a fashion to meet temporary needs and often resulted in mines collapsing if they were left unworked for periods of time (Watson 1908:26).

Concentrating the ore generally involved washing, crushing, and jigging. The specific processes used at a given plant reflected the nature of the ore as well as chronological differences. Watson (1908:27) described early treatments as being minimal, and much of the ore was shipped with large quantities of adhering clay. Cleaning with log washers became the minimum treatment, which was suitable for denser deposits because the percentage of clay to ore was so small. Later, all manganese passed through log washers as part of the typical processing (Watson 1908:27; Kesler 1950:58). Porous or spongy-textured varieties of ore with quantities of embedded clay, or breccia containing siliceous material required additional concentration with grizzlies, trammels, and jigs (Hull et al 1919).

Watson (1908:26-27) described manganese mining in Georgia as being somewhat transient because the small extent of ore deposits did not justify the establishment of permanent mining plants. He recommended avoiding the installation of expensive machinery, elaborate buildings, and heavy equipment. Rather, he suggested that miners use light and portable gear that could be moved from mine to mine as deposits became exhausted.

Barite

Barite mining in Georgia was confined mainly to the Cartersville area. The mineral occurred in vein, replacement, breccia, residual colluvial, and alluvial deposits (McConnel and Abrams 1984:60). Stratigraphically, it lay above ocher, although it was not discovered to have economic significance until after the ocher industry was established. This discovery led to both ores being mined simultaneously from individual mines (Gray 2003:251).

Prospecting and testing for barite ore was made with pits measuring about three feet in diameter and 10-40 feet deep (Hull 1920:34; Ladoo 1925:71). Workable ore deposits were typically on ridge flanks and lay parallel to the ridge. It was mined entirely with open cuts using hand methods, and later mechanical excavation, following the side of the ridge. Blasting was sometimes used to loosen the working face of the cut. Cuts could be several hundred feet long and were known to reach depths between 50 and 100 feet in some instances (Hull 1920:34-35; Kesler 1950:58) (Figure 58). Mules and later steam or oil-burning engines pulled ore cars to the concentrating plant. At mines lower in elevation than the plant, hoisting equipment would be used as well (Hull 1920:35).

Beneficiation of barites in Georgia mainly involved washing and jigging. Hull (1920:36-37) described the typical process in the Cartersville district, stating that each mine employed variations on the basic sequence. Ores first passed through grizzlies and into log washers to remove the bulk of impurities. Oversize rocks were hand-broken and then sent to the washers. The rock emerging from the washers went to trammels to be classified, while the wash water carried fine sediments to retention ponds for settling. The smaller pieces emerging from the trammel went directly to jigs while picking belts carried away the oversize for hand sorting, the barites going to storage bins and the nonvaluable pieces going to rock dumps. The material passing through the jigs was sorted into two classes: less than one-eighth inch, which went to a hutch dump, and one-eighth to three-quarters inches, which entered the storage bins. The hutch dump contained as much as 60 percent barites and was sometimes re-jigged or used as road surfacing. Thompson-Weinman & Company near Cartersville was an exception to the typical process, operating a grinding and bleaching mill to produce a higher-grade product (Hull 1920:37-38).

Figure 58. Barite mines could be several hundred feet long and up to 50 feet deep. Bertha mine, Bartow County (Source: Hull 1920).

Ocher

Ocher consists of finely intermixed limonite and clay with smaller and variable proportions of fine-grained quartz and muscovite (Kesler 1950:54). The mineral occurs as secondary deposits in residual clays and its distribution was closely associated with manganese. The chief production area of ocher in Georgia was the district around Cartersville (Watson 1906; Kesler 1950:51). Stratigraphically, it lay below colluvial deposits and only outcropped at natural and artificial cuts (Watson 1906:33).

Most mining was through underground methods. Mechanical excavation and open-pit methods were rare in the district (Kesler 1950:60). Mining proceeded with picks and shovels, with blasting used when the ocher was embedded in unweathered quartzite. In larger mines, underground tramways and lights were required. The clay and quartzite country rock were apt to collapse and so the tunnels required timbering. Mules sometimes provided power for hauling the ore trams (Watson 1906:44, 71-72).

At the turn of the twentieth century, ocher mined in Georgia was refined before sending it to market. The process involved separating impurities of sand, clay, and manganese oxide from the valuable mineral, drying, pulverizing, and packing. Washing, usually in log washers, provided the means for removing heavier and coarser impurities. This process placed the ocher particles in suspension while allowing the heavier materials to sink. The ocher solution flowed out of the washer into a series of vats where it was allowed to settle while the water was eliminated by siphoning and evaporation. Steam heating was sometimes used to speed evaporation and drying. When firm enough to be handled, the ocher was removed from the vats and placed on racks in a drying shed to completely dry (Figure 59). Once ready, the ocher was pulverized and packed into barrels and bags for shipping (Watson 1906:72-75). Although Watson (1906) did not specifically mention the methods for pulverizing, this step probably involved mechanical crushers and grinders.

Kesler (1950:60) stated that only one district operator refined the ocher by the mid-twentieth century. Refining involved putting the raw ocher through a log washer to remove rock and coarse sand. The overflow contained the ocher and fine sand, which was removed and the slime was dried in revolving steam drums, crushed, and bagged.

Bauxite

Georgia was a major producer of bauxite during the early twentieth century and the northwest section of the state was one of the first places in the country to produce it (Watson 1904:25; Ladoo 1925:82). Bauxite is a hydrated alumina that formed in place by the weathering of aluminus minerals. It was found as pebble, pisolitic, oolitic, vesicular, or amorphous ores within clay. Deposits were distributed irregularly and in disconnected pockets that graded into enclosing bauxitic clay. They most often lay on slopes and crests of limestone ridges and occasionally in valley bottoms (Watson 1904:55-56, 150; McConnell and Abrams 1984:62).

Mining bauxite in north Georgia was by both open pit and underground methods. Early in the twentieth century, most bauxite was mined with small pits and prospect holes, with the excavated material being hoisted to the surface with hand- or machine-powered windlass. In some instances, larger scale excavations were opened, however, involving cuts for tramcars and developed faces to remove the ore, as well as powered hoisting equipment and trams (Watson 1904:151-152). Excavation by hand, however, remained the most common technique as the ore was very soft and hand work allowed picking to be conducted at the mine site (Ladoo 1925:84).

Preparation of the ore for shipping typically included drying to save on freight charges and facilitate grinding. Drying was done by natural methods to using heated rotary cylinders. Sometimes, the ore was also sorted with log washers if it was in pebble form with a high amount of clay matrix. Smaller operators often performed no preparation, however, and simply shipped the ore in its “green” (undried) state (Watson 1904:151-153; Ladoo 1925:85).

Figure 59. Ocher processing required letting the solution of ocher evaporate in shallow vats and then drying thoroughly in racks. Setting vats and drying sheds, Cherokee Ocher and Barite Company, Bartow County (Source: McCallie 1926).

Pyrite

Pyrite, an iron sulfide, occurred as a primary mineral associated with quartz and other rocks and has a granular or lump texture. In Georgia, economically important sources lay in a discontinuous belt running northeast to southwest between Carroll and White counties. Another source was at the Tennessee line in Fannin County. In Georgia, it was mined primarily as a source of sulfuric acid. Copper and gold may also be generated from pyrite as by-products of the acid-making process (Shearer and Hull 1918).

Plants producing sulfuric acid were generally not directly associated with the mining and concentrating operation. Of the acid plants in Georgia around 1920, only a few were located in north Georgia and none produced acid at the mine (Wells and Fogg 1920). The main products of mining and milling plants were concentrated ores (Shearer and Hull 1918).

Pyrite extraction in Georgia took place in underground workings, some of which were extensive (see Figure 35). The methods used to concentrate pyrite generally followed those used for other metallic ores. The typical procedure involved passing the ores through crushing and grinding machines to reduce it finely enough to separate the pyrite from the waste (Ladoo 1925:469). Mills in Georgia normally used a series of crushers and rollers to break down the ores; hand picking, grizzlies, and trammels to separate it into different sizes; and jigs to concentrate the valuable mineral even further. Some mills also sent the product of the jigs to concentrating tables for additional treatment (Shearer and Hull 1918) (Figure 60). In general, mills produced three grades of ore: "lump," being less than 18 inches and having all the fines screened out; "furnace," measuring between 2.5 and 0.25 inches; and fines, which were all less than 0.25 inches (Wells and Fogg 1920:38).

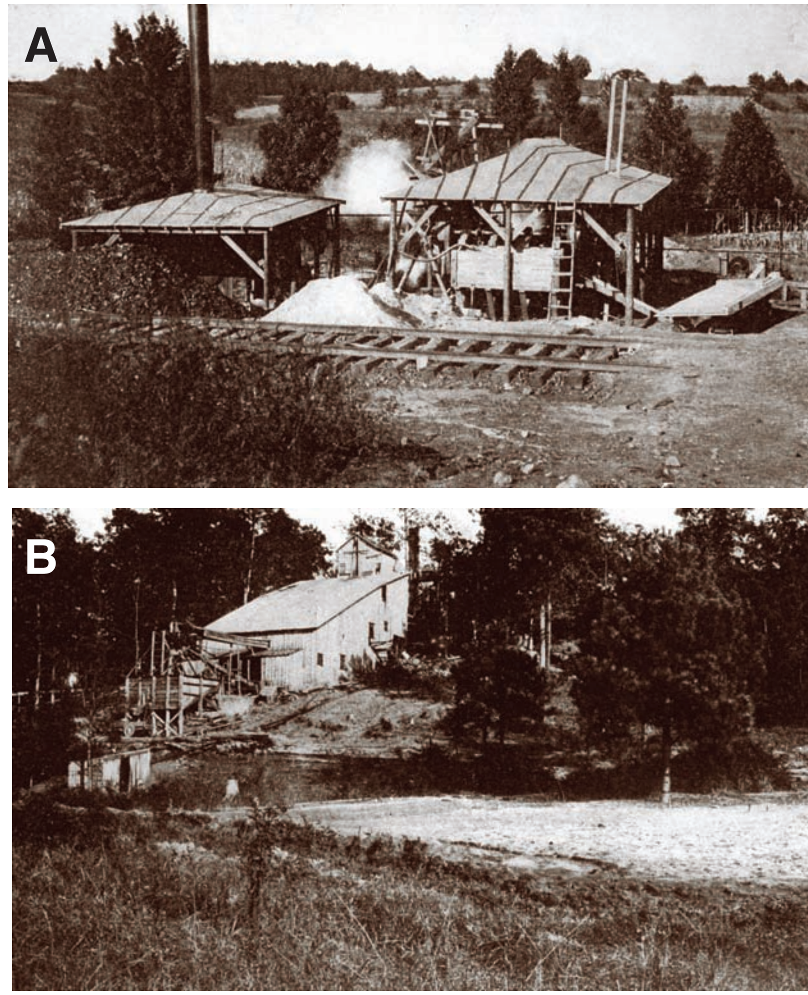


Figure 60. Pyrite mills in Georgia minimally crushed and concentrated ores for shipment. Mills could be relatively small for basic processing, while larger ones conducted more elaborate beneficiation.

A) Shirley Pyrite Mine and Plant, Paulding County (Source: Shearer and Hull 1918).

B) Marietta Pyrite Mine and Plant, Cobb County (Source: Shearer and Hull 1918).

ROCK QUARRYING, SHAPING, AND BREAKING

Rock was a significant product among the economically important minerals produced in Georgia. Stone could be used in three principal ways: as shaped pieces for masonry or monuments; crushed for construction, road building, or other uses; and as a constituent of another product, such as cement. Rocks excavated in Georgia that were put towards these purposes included marble, granite, limestone, cement, and slate. Other rock types, such as sandstone, were excavated in minor amounts or only experimented with but never developed into economically significant products.

The nature of the rock and its intended use influenced how it was excavated and handled. Rocks were most often taken out of open pits or surface works called quarries, but in some instances, the nature of the rock and overburden required working underground, in which case the extraction sites would be classified as mines. (The term "quarry" is also primarily used for stone. Workings for metal ore, clay, and coal excavated from open pits are usually called "banks" or "pits" [Thrush 1968].) Nearly all rock excavation in Georgia took place in quarries and the following discussion deals only with this type of excavation.

The steps involved in quarrying rocks and preparing them for use varied depending on the intended use. Dimension stone, which was used for masonry, building components, street curbing and pavers, and monuments (funerary, ornamental, and other types) required considerable control during excavation and handling. Stone being used for crushed rock or other products like cement, known as "rubble stone" or "backing stone," was quarried in rough slabs or blocks (Gillette 1904:184). The procedures for locating and developing a quarry, however, applied to all stone regardless of its planned use.

As with ores, prospecting comprised the first step to developing a rock quarry. Prospecting accomplished several requirements in addition to identifying a suitable source of rock and assessing its quality. It also provided information on the extent of the rock, which was necessary to plan how to best exploit it, and helped determine if the deposit could sustain the scale of the planned operation. Finally, prospecting included consideration of factors like the quarry's accessibility to markets, the costs of working it, the types of equipment that would be necessary, the availability of labor, and demand. Additionally, for later operations, sources of power and their availability would have to be taken into account (Greenwell and Elsden 1913; Severinghaus 1953:68).

Another consideration was whether there was space to operate. This was particularly true in areas where there were already other kinds of development. A quarry had a considerable footprint that encompassed the pit along with areas for processing stone, dumping waste rock and overburden, and other activities (see Figure 24). Additionally, it was necessary to consider the effects of blasting on the quarry neighborhood (Severinghaus 1953:68). These last considerations were important because rock tends to be a local commodity and production points were often located close to population centers, which had the largest markets for stone (Kantor and Saeger 1939:3).

The first step in operating the quarry was to remove any overburden, consisting of soil and unusable rock layers (Greenwell and Elsden 1913). The amount of work required for this task depended, obviously, on how deep the desired rock lay. Stripping was performed by hand or with horse-drawn drag scrapers until the twentieth century, when mechanical excavating equipment was introduced. Hand stripping was limited in depth to about 10 feet, below which the cost of removing the overburden outweighed the profits of the quarry (Kantor and Saeger 1939:26-27).

Once the rock was exposed, the next step was to develop a quarry face. How a quarry was approached and what it produced depended on various aspects of the rock, its dip (its angle of inclination relative to horizontal), and its strike (the line that the dip makes where it intersects the horizontal). In addition, quarrymen made use of the natural cleavages, joints, and other fissures in the rock (Figure 61). The physical situation of the rock also influenced whether the quarry was a bank type or a pit type. A pit quarry required the installation of hoisting equipment, whereas a bank quarry amounted to excavating a hillside and the quarry floor was at the same level as the processing and shipping activities (Gillette 1904; Greenwell and Elsden 1913).

DIMENSION STONE

The principal tasks of working the quarry for dimension stone were removing the rock, performing any necessary preliminary reduction and shaping, and hoisting or loading. For dimension stone, large blocks were removed from the quarry face by taking advantage of the natural joints and cleavages, as well as with various drilling, chiseling, wedging, prying, and blasting methods to create fractures. With proper technique, fracture planes could be nearly straight. Once four sides of a block were exposed or freed from the face, the piece could be pried loose from the bottom so that chains could be slung underneath it for lifting (Gillette 1904:184; Greenwell and Elsden 1913). The slabs produced by these techniques were often enormous, weighing tens to hundreds of tons, and before they were lifted or hauled from the quarry, they were broken up into smaller pieces (Figure 62).

Quarrying in Stone Mountain and Lithonia required special methods because the granite possesses few joints and cleavages. Techniques were developed to create slabs that could be cut into desired sizes. The first step in the process was to drill two adjacent vertical holes, each hole with a diameter of around three inches, to a depth of around eight feet. Small charges of black powder were detonated at the bottom of the holes. The explosions would start a small fracture that began to radiate horizontally from the base of the holes. Repeated small blasts over several weeks or months eventually created a cleavage with a diameter of around 120-160 feet. At that point, compressed air was forced into the fracture through the drills holes, causing the cleavage to widen and emerge somewhere on the quarry floor. Quarrying then began at the point where the plane “ran out” or emerged at the surface. This process might loosen an area of up to one or two acres, sufficient for an entire season’s worth of granite (Furcron et al. 1938:53-54; Herrmann 1954:88).

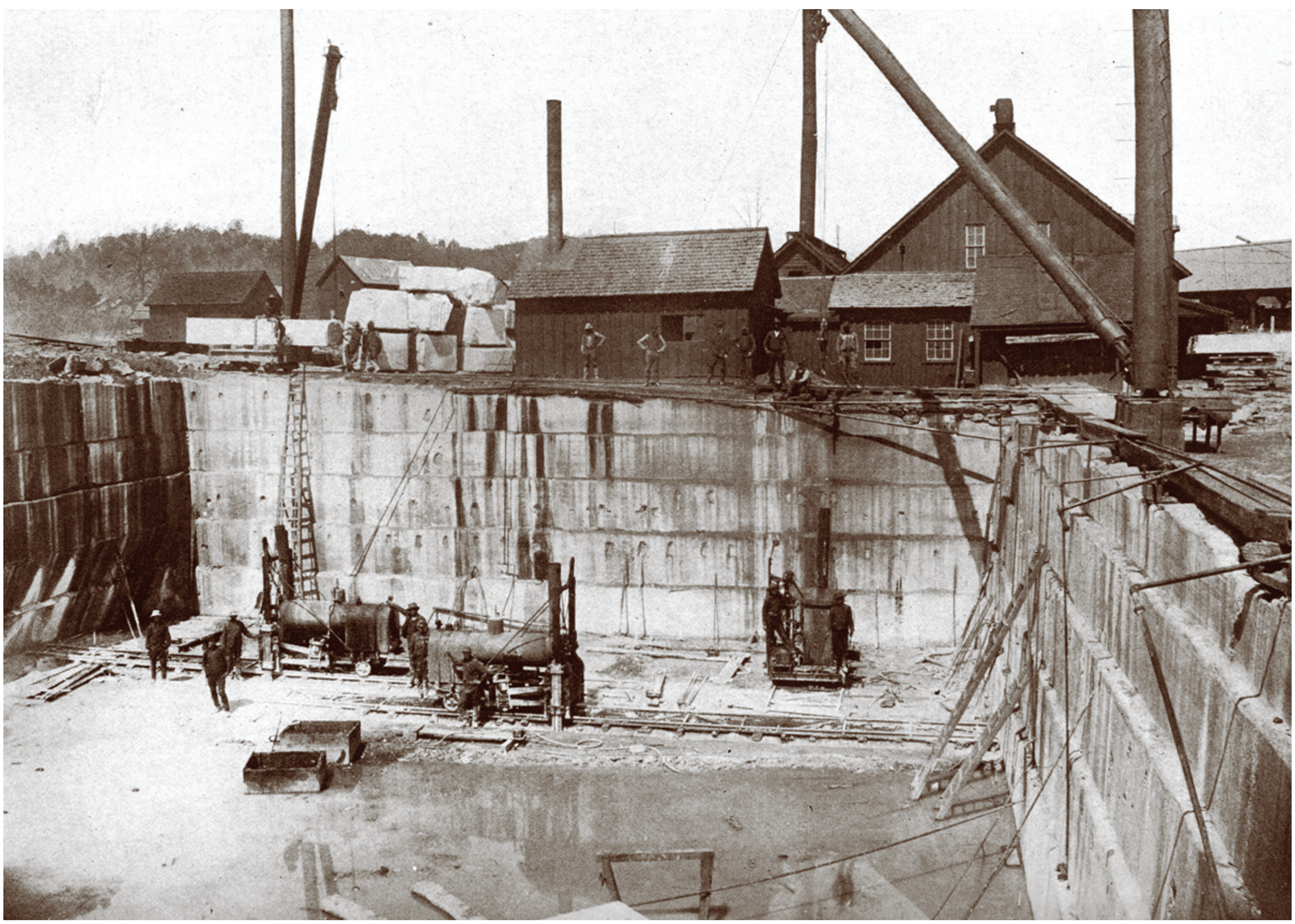
These portions of the quarrying process were accomplished with both hand and mechanical equipment. Hand tools used in quarrying included varieties of hammers, drills, chisels, and wedges

Figure 61. Natural cleavages (horizontal planes) and joints (vertical breaks) in marble. Unidentified quarry, Gilmer County, 1912 (Source:USGS 2006b).

(Figure 63). By the late nineteenth century power drills were developed that increased the efficiency of boring wedge- and blast holes (Greenwell and Elsden 1913) (Figure 64). Some techniques combined hand and mechanical equipment. Splitting rocks using "plugs and feathers" involved drilling a row of holes across the fracture line and then using wedges to break apart the rock. The "feathers," consisting of two hemispherical rods, were placed in the drill holes and then the plug, a narrow wedge, was driven between the feathers until the rock split. This technique could work on blocks of six feet thick using holes only five inches deep (Gillette 1904:187-188) (Figure 65).

Varieties of power drills included the "gadder," a mount that allowed the drill to slide up and down on a pole to drill along a straight vertical line, and the "quarry bar," consisting of a horizontal rod that allowed the drill to move back and forth and make holes in a horizontal line (see Figure 20). Another important piece of equipment was the "channeling machine," or "channeler," consisting of a steam-powered machine that cut a series of closely spaced drill holes, essentially making a single linear channel. The machines ran on tracks to make straight lines and were sometimes deployed across the quarry floor to create a series of parallel and perpendicular cuts, which formed the four sides of

Figure 62. Quarries produced massive blocks of stone that required large cranes and other hoisting equipment to move. Note the mechanical stone cutting equipment ("channelers") in use on the quarry floor. Georgia Marble Company Cherokee Quarry, Pickens County (Source: McCallie 1907).



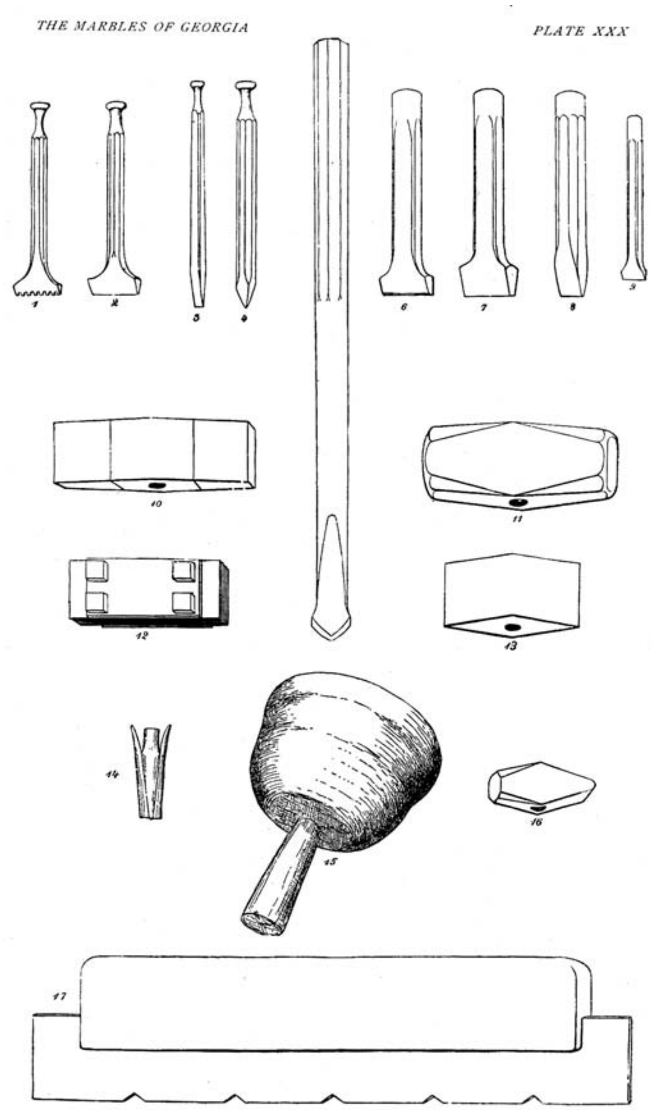


Figure 63. Hand tools used in stone quarrying and cutting (No. 44 is a "plug and feather") (Source: McCallie 1907).

individual blocks (Figure 66, also see Figure 62). Yet another technological development was the wire saw, a powered device that used an endless cord to make vertical cuts into the rock (Gillette 1904:194; Greenwell and Elsden 1913:248-250, 255, 259, 268).

To move and lift slabs, quarrymen used a variety of cranes and jacks. Cranes were a mandatory piece of equipment for any quarry producing sizeable stone. Early versions relied on block and tackle and were relatively simple. Greenwell and Elsden (1913:329) described these early types as consisting of a central mast supported by stays or guys and having a movable jib. Later, steam-powered cranes that operated on rails and then caterpillar tracks were used (Kantor and Saeger 1939). Various overhead traveling cranes, gantries, cableways, ropeways, and blondins were also used in quarries (Greenwell and Elsden 1913) (Figure 67).

Once out of the quarry, dimension stone might be finished at the site or sent elsewhere to specialist stoneworks. Early finishing was handwork, but by the late nineteenth century, stone dressing machines were developed. These included saws, lathes for turning columns and similar shapes, drills, polishers, and molding and planing machines. All of these machines were large and their use at a quarry entailed the allocation of space for a variety of workshops, powerhouses, and other buildings.

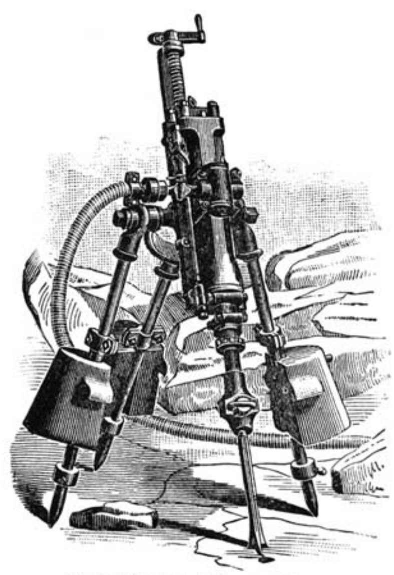


Figure 64. Powered rock drills were available by the late nineteenth century (Source: McCallie 1907).

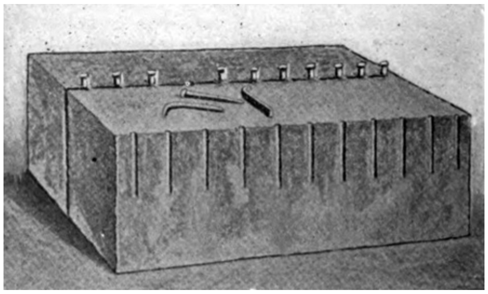
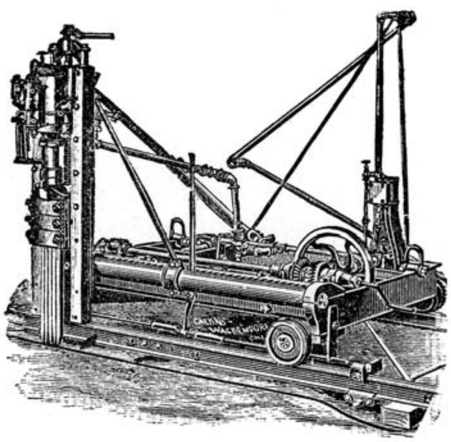


Figure 65. Plugs and feathers used to split large stone blocks (Source: Gillette 1904).

A



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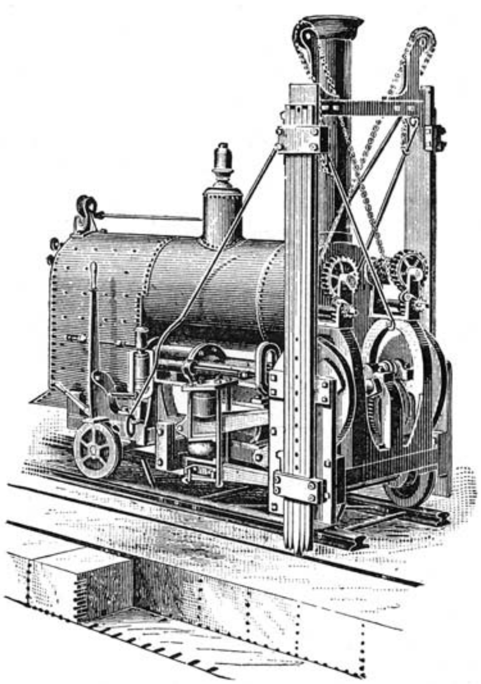


Figure 66. Two varieties of channeling machines were common in Georgia.

A) Sullivan Channeling Machine (Source: McCallie 1907).

B) Wardwell Channeling Machine (Source: McCallie 1907).

CRUSHED ROCK

At quarries producing crushed rock, the processes of excavation, hauling, and preparation for market varied considerably from those turning out dimension stone. Crushed rock quarrying did not require the kind of controlled fracturing and cutting as dimension stone. Blasting was commonly used to free it from the quarry face, with the charges placed into hand or power-drilled holes. The blast yielded a quantity of irregularly fractured stone pieces for the crushing plant. While dimension stone was not necessarily finished at the extraction site, stone crushing plants were almost always at the quarry.

In early crushed rock operations, the broken rock was loaded by hand into cars or carts to be hauled to the breaking plant. The rocks blasted from the quarry face sometimes required preliminary breaking to fit the relatively small capacity jaw crushers used before the early twentieth century. This preliminary breaking was done with hand tools. Sometimes, however, quarrymen smashed the rock by dropping a metal ball on it from a loader derrick, a method known as “steel balling.” One-man jackhammers and inexpensive explosives later replaced this technique. Draft animals performed most of the hauling at early quarries, although some used small steam locomotives (“dinkies”) to pull trains of small ore cars. Later developments in loading and hauling included the use of steam-powered loaders, which handled larger quantities of rock than hand loading and moved it faster. The adoption of these machines led to larger and stronger cars for hauling (Kantor and Saeger 1939:23-24; 37-38; Herrmann 1954:89).

The objective of the plant was to produce uniformly sized stone fragments. A single plant usually produced several sizes to have greater marketability (Severinghaus 1953:72). At the plant, the rock went

Figure 67. Various lifting equipment was necessary to take stone from the quarry and move it around the stoneyard.

A) Derrick cranes were common at Georgia quarries. Piedmont Marble Works, Pickens County (Source: McCallie 1894).

B) Locomotive crane used in the stockyard of the Blue Ridge Marble Company, Pickens County (Source: McCallie 1907).

C) Cableway used at the Georgia Slate Company Dever Quarry, Polk County (Source: Shearer 1918).

Figure 68. Multistory stone crushing plants required sturdy buildings to support heavy machinery on upper floors. Whitestone Marble Company Mill, Pickens County (Source: Maynard 1912).

through similar sequences of breaking, crushing, and classifying as ore. Many of the same machines were used for both processes, including primary and secondary jaw and gyratory crushers, a variety of screens for sorting the stone by size, and washers. The chief difference from ore dressing was that classified rock constituted the final product of the plant and no further mechanical or chemical treatments were applied. The crushing plants typically consisted of multi-story and heavy structures that could make use of gravity to move the rock through the process and hold the extremely heavy equipment used for the first stages of crushing (Greenwell and Elsden 1913:430; Kantor and Saeger 1939) (Figure 68).

Kantor and Saeger (1939) explained that technological advances in the twentieth century influenced the way rock crushing was arranged and operated. The advent of power loading increased the speed and volume of rock that could be moved out of a quarry. Among the improvements in power shovels was the replacement of steam with electric power and later diesel and gasoline. Placing them on caterpillar tracks provided greater mobility while improvements in the swing radius of the shovel arm made the machines more efficient. Excavating machines also became larger and more powerful during the first decades of the twentieth century, thus increasing the loads they could manage and allowing them to handle not just dirt but also to excavate softer varieties of stone (whereas with harder stones, this equipment was used only for loading but not excavating). Because these developments also made removal of overburden easier, they expanded the use of open pit or surface mining (Tryon et al. 1937:12, 34; Kantor and Saeger 1939:52-54).

Improvements in excavation and loading led directly to changes in other aspects of the process. Larger and sturdier cars for hauling rock had to be designed to keep up with the higher output of mechanical loaders. Subsequent improvements involved cars that could dump from the side or were placed into racks that turned the entire car over to empty it. Motor dump trucks appeared during the 1910s and provided greater flexibility and efficiency because they operated independently of fixed rail tracks (Kantor and Saeger 1939:56-59).

Technological upgrades at the crushing plant included the advent of mechanical conveyors along with yard cranes and motor vehicles, which allowed for changes in the arrangement and structures of the plant. Early plants required a tall building that made use of gravity to move rock through and downward through the process. Moreover, because the final product could not be shifted laterally in a cost-effective and efficient way, it had to be stored at the plant, which had little storage space. The consequence of this was that if the product was not shipped immediately, it caused the entire process to slow or stop until the exit point was cleared.

Technological improvements allowed for new arrangements. Conveyor belts were particularly helpful here because they could move materials horizontally and at low inclines, which allowed the single multi-story building to be replaced with several low buildings. In addition, while the earlier buildings had to support the heaviest equipment on the upper floors, newer plants could place these machines at ground level, feed them with inclined belts, and haul the product away to the next process with another set of belts (Figure 69). Along with saving on construction costs, this new arrangement also provided greater opportunities for storage because materials could be stockpiled at a distance from the breaking and screening area. Improved loading equipment enabled the stockpiles to be reclaimed for shipping more easily (Kantor and Saeger 1939). Certain of these developments, particularly the excavating, loading, and intrasite movement of materials, also applied to other mineral industries, such as gravel and clay mining.

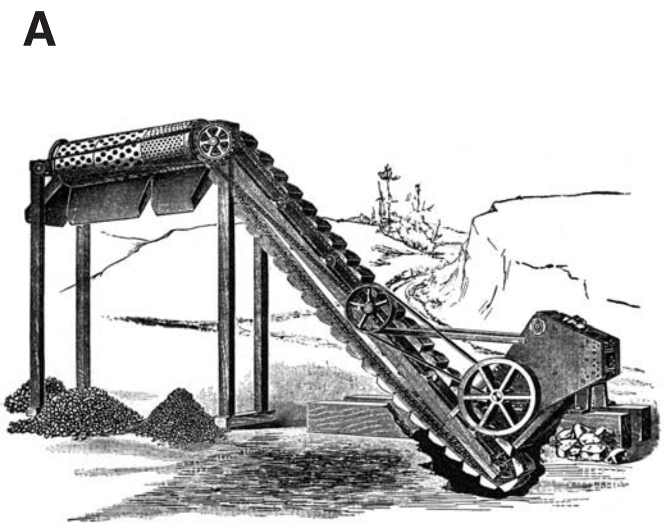
The scale of a quarrying operation varied depending on the product. Herrmann (1954:89) noted that because of the heavy equipment necessary, only larger operators could produce large blocks, such as used for jetty and dimension stone. In contrast, rough stone for curbing could be completed at a small plant using minimum equipment. Therefore, many small operators employing a few men using jackhammers, plug drills, mallets, and wedges could profitably manufacture this product. In addition, crushed stone needed larger quarries and plant areas than dimension stone because the small margin of profit made it necessary to turn out significant quantities.

SLATE

Although quarried using similar techniques as other stone, slate had certain unique qualities and was used for certain products that required special handling. Therefore, quarrying and processing procedures for slate are briefly summarized separately. The slate industry turned out various building products that were distinct from those generated by the granite and marble industries, in particular roof shingles and granules for roofing (Butts and Gildersleeve 1948:154), and therefore, it is worth highlighting some of the aspects of their manufacture.

Methods for quarrying slate followed the general procedures outlined previously. During the late nineteenth to early twentieth centuries, all slate in Georgia was quarried from surface cuts. Older methods included loosening the slate with black power blasts, which resulted in considerable waste. Modern methods included cutting machines such as channelers. The use of these machines also provided more stability to quarry walls as the excavations became deeper. Shoring could be accomplished by leaving pillars or artificial props (Shearer 1918:37-38).

Blocks or slabs were removed from the quarry with aerial cableways (see Figure 67c). The slabs could be sawn at the quarry site or sent to slate mills in a



rough condition. Processing of slate slabs began by removing rough edges on sawing tables and then cutting the blocks into the desired sizes. Slate for mill-stock was split to the proper thickness and planed, carved, or turned by specialized machines. For roofing tiles, the slate was sawn into blocks of workable size and sent to splitting shanties, "shanties" referring to a work group composed of three skilled workmen, the block-maker, the splitter, and the dresser, rather than a structure (Shearer 1918:37-38) (see Figure 27). By the 1910s, this handwork had started to be replaced by a slate splitting machine, but inasmuch as the slate industry had begun to decline in Georgia by this time, these machines might never have been used here.

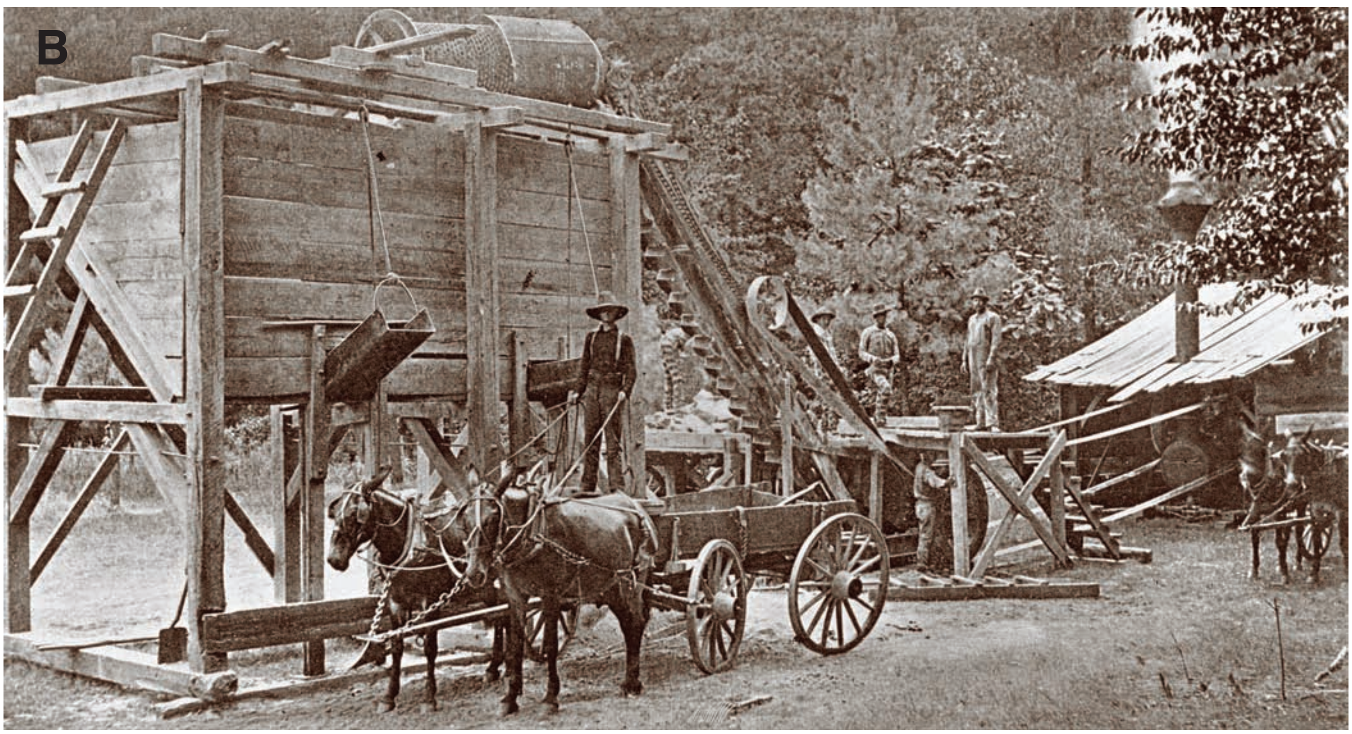


Figure 69. Technological developments led to changes in the way crushed rock was handled. Conveyors made it possible to spread out operations over a horizontal area to the use lighter structures and buildings.

A) Champion rock crusher with elevator and screen attached (Source: McCallie 1901).

B) Portable crushing unit, Dekalb County (Source: McCallie 1901).

Slate could also be ground to produce granules for use on composite roofing (Shearer 1918:40; Ladoo 1925:544). This product was made by a limited number of producers in Georgia during the twentieth century (Vallely and Peyton 1955:262). Specific methods and hardware for making this material were not determined for this study but it is likely that the various crushing, grinding, and sorting equipment described elsewhere were used in this industry.

SAND AND GRAVEL

Sand and gravel were important mineral resources largely associated with the Coastal Plain of Georgia, although though they were quarried in the northern parts of the state on a smaller scale. These were inexpensive materials that did not warrant the expense of long distance shipping. Therefore, up-state quarries mainly produced for local markets. Alluvial gravel was used for construction, roads, railroads, roofs, and in tube mills. Sand had uses for foundries, glass making, locomotives, abrasives, and fire extinguishing (Teas 1921:7-8; McConnel and Abrams 1984:64).

Despite being a relatively small industry in north Georgia, sand and gravel operations utilized some unique equipment and took place in different locations than other mineral industries. Teas (1921) described the methods for quarrying and processing sand and gravel in north Georgia. Streambeds and gravel bars were the principal quarrying sites in the region. Materials were most often sucked from the rivers and creeks using centrifugal pumps mounted on the stream bank or sometimes on barges. Teas noted instances where dams were built to slow the flow of a stream and cause it to drop sand and gravel for dredging and collection. Materials collected from river terraces or floodplains, like other minerals, were excavated by hand or with various animal-powered or mechanical excavators. Because excavation usually took place in bottomlands, the sand and gravel industry made common use of elevators to raise materials to the processing plant.

Figure 70. The Acme Sand and Supply Company Washing and Screening Plant, Atlanta (Source: Teas 1921).

Preparation for market mostly involved washing (if excavated from a terrestrial source) and screening into size classes. Often, even this step was omitted and the material was loaded directly into railroad cars that allowed the water and smaller particles to drain (Teas 1921:119-120). The degree to which the material was classified depended on the intended market and its requirements for specific sized gravel. In addition, the scale of operations could vary widely. For instance, the Fulton County Department of Public Works owned a mobile pumping unit to obtain sand for specific construction projects. At the other extreme, the Acme Sand and Supply Company operated a large-scale plant on Peachtree Creek in Fulton County that raised the sand over 25 feet from the stream level to a trommel that removed twigs, cinders, and pebbles before the sand passed through various sluices and tanks to remove clay (Figure 70). A chute then delivered the sand to tram cars that were pulled up a 100-foot long incline and dumped into bins that fed the delivery trucks (Teas 1921:299-300) (Figure 71).

CLAY AND CLAYEY MINERALS

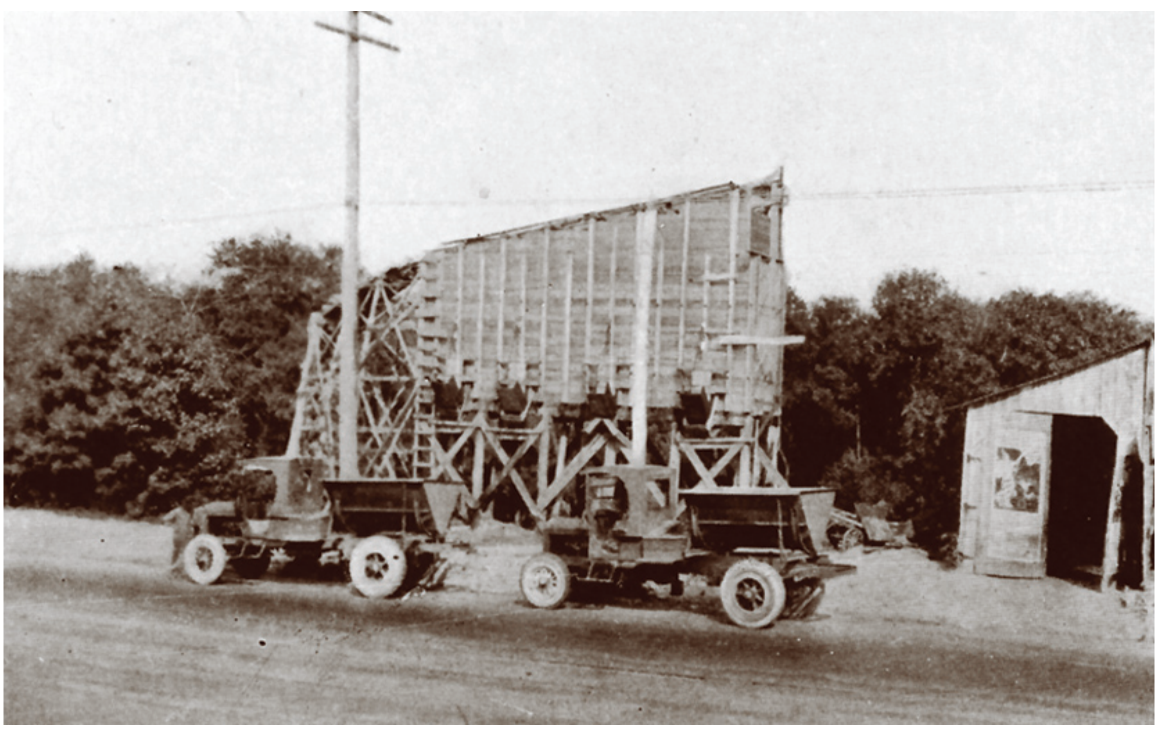
Clay was an important industry in Georgia and in the northern part of the state, principal products were shales and residual clays that were used primarily for brick making and similar products like drain pipe and tiles. Sedimentary kaolin was mined for various industrial purposes, and it remains an important industry in the Sand Hills region.

SHALE AND BRICK CLAY

Brick making was usually a local industry in that the raw materials, manufacturing locations, and markets were located relatively close together. This began to change in the twentieth century as operations became more far-flung and north Georgia began importing raw materials, mainly shale and clay, to brickyards outside the state. Manufacture of bricks and other clay products does not represent a mining industry as such, but this industry produced features and resource types that would include mineral extraction operations. Clay for brick making was widely distributed throughout north Georgia and was used during the nineteenth and twentieth centuries. Shale was also used for bricks beginning in the twentieth century (Veatch 1909:286, 387).

In general, brick making involved the extraction of clay and shale, rendering it elastic enough for molding, shaping it into bricks, drying, and firing. As this study is primarily concerned with features related to mining and processing minerals, the entire brick-making procedure is not described here (see Gurke 1987 for a description). Features of a brick-making operation that would look like a mineral extraction site include the clay or shale quarry and associated structures for hauling the raw materials. Clay was excavated by hand or with animal-drawn scrapers until the twentieth century. Shale was mined with mechanical excavators and was prepared for molding by first grinding and mixing in dry pans. After leaving the dry pan, it might be sifted to uniform size on vibrating screens and then sent to mixing and molding (Smith 1931:116). The nature of shale in Georgia sometimes required additional procedures to improve the molding and firing properties. These included fine grinding, extended pugging, using hot tempering water (tempering was the process of mixing water with the shale to develop plasticity), and adding certain electrolytes to the tempering water (Butts and Gildersleeve 1948:97).

Figure 71.Storage bins and delivery trucks of the Acme Sand and Supply Company on Peachtree Road, Atlanta (Source: Teas 1921).



In some instances, the shale mines and clay pits might not be located at the brickyard. The operations of the W.S. Dickey Clay Manufacturing Company during the 1920s illustrated the range of sites that might be associated with a large operation. With a headquarters in Kansas City, the company ran a plant near Blowing Station in Walker County, Georgia. After the local clay and shale deposits were exhausted, the company shipped clay and shale to this plant from Rome, Georgia; Graysville, Tennessee; and Birmingham, Alabama. The Rome 10-acre shale pit was excavated by steam shovel, the shale being hoisted out with gondolas, and shipped raw material to plants at Rome, Macon, and Chattanooga, in addition to Blowing Station (Smith 1931:80, 164). Archaeologically, in this instance the shale pit might resemble a quarry operated only to obtain a raw material without the associated processing plant.

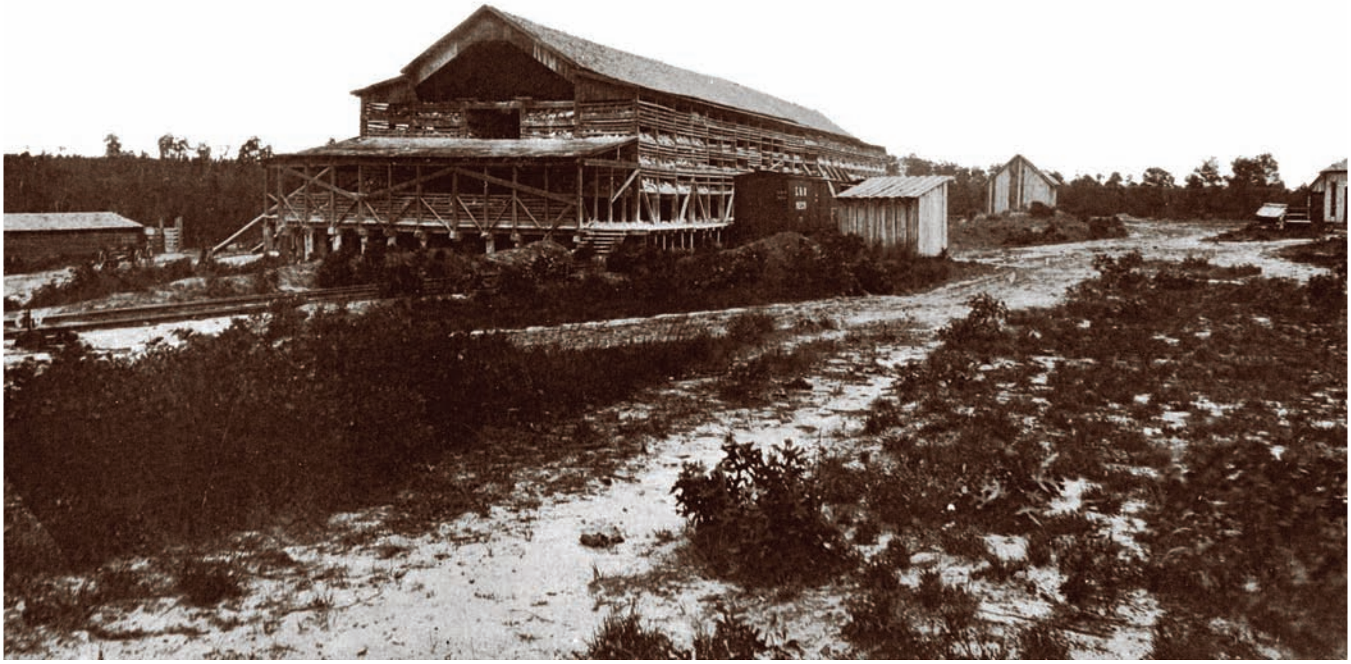
KAOLIN

Kaolin represented a significant mining activity in Georgia. Except for infrequent instances where it was used for local products such as pottery or brick making, kaolin was always shipped out of the state for use by various industries. Processes for extracting and preparing kaolin for shipment involved removing it from the ground, transporting it to the processing plant, and passing it through a variety of drying and/or cleaning procedures before packing it for shipment. The largest kaolin-producing region of Georgia was in the Sand Hills but kaolin was also mined in the Piedmont.

Kaolin mining always took place in open cuts because the sandy overlying soils were not stable enough to support shafts or inclines. The first task in starting a mine was to remove the overburden. At early mines, the maximum thickness of overburden that could be taken away economically was about 40 feet. Because of this limit, many early mines were at stream valleys, where the overburden was eroded to a manageable thickness. Stripping was done by hand, drag-scraper, or steam shovel. The overburden was considered waste and was hauled away and dumped (Sloan 1904, 1908:367; Veatch 1909:190-191; Ries et al. 1922:163-164, 192-193). Even after mechanical equipment was widely employed in removing overburden, much of the actual kaolin extraction was performed by hand until the 1930s because the off-color or other inferior products could be picked out at the pit (Smith 1928; Munyan 1938:2). Later methods of processing eliminated this requirement.

As with quarrying, hand excavation of kaolin started by creating a vertical face or “breast” from which the pit would expand outward. Because the clay was too solid to be simply shoveled from the face, it was often pried loose from the top of the face and then broken into pieces for loading into tramcars (Smith 1928). The cars were hauled out of the pit on inclined tracks or ramps, small railroads, or overhead cableways with gondolas (Sloan 1904:63; Veatch 1909:191; Sproat 1916:12-13). As mechanical equipment improved, excavation of the kaolin was done with mechanical excavators and loaded into large cars pulled by steam engines or into dump trucks (Munyan 1938).

Kaolin processing depended on the intended market as well as chronology. The earliest and simplest procedure was to dry the clay in open sheds and then break it into pieces for packing into large hogsheads and shipped (Figure 72). Breaking was done with mauls or mechanical roll crushers (Sloan 1904; Veatch 1909:192; Sproat 1916:12-13; Smith 1928:156-157).



Figrue 72. Kaolin processing initially entailed drying raw clay in open-air sheds and then breaking it up for shipping. Albion Kaolin Company drying shed, Richmond County (Source: Veatch 1909).

Washing turned out a more refined product and required less sorting at the clay pit (Figure 73). The clay was delivered to machines called “blungers” that mixed the clay with water to create a slip. The slip was sent through a series of traps and troughs to remove sand and mica flakes before it was allowed to concentrate in settling tanks. The clay was then placed into filter presses to squeeze out the excess water. The presses turned out kaolin cakes that were dried by air or in heated driers and then crushed or pulverized for shipment. Crushed kaolin was typically loaded directly into paper-lined railroad cars while the pulverized kind was bagged (Sproat 1916:13; Smith 1928:222; Munyan 1938:14; Patterson and Buie 1974:11).

Another development in dry-processing the kaolin was air classifying. This involved sending the clay through heated driers and a series of mechanical crushers before screening it to remove larger particles, which were sent back to the crushing machines. Finely crushed particles went to a pulverizer and then through a series of air classifiers that separated the fine clay from the mica and coarser sand and clay fragments. The rejected materials could be added to the blunger if the plant was equipped for it while the finer air-sorted material was collected and bagged for shipment (Munyan 1938:13).

Figure 73. Kaolin washing plants were larger and more elaborate than traditional drying and crushing plants, but turned out a more refined product. Georgia Kaolin Company Refining Plant, Twiggs County (Source: Sproat 1916).

MINERAL FUEL - COAL

Coal mining took place only in Dade and Walker counties in the far northwest corner of Georgia. Coal occurred among cyclic beds of Pennsylvanian-age sandstone, siltstone, clay, and shale (USDA 2006). Commercially significant beds of coal were in continuous seams between one and several feet thick that covered areas estimated to reach 1,000 acres under ground (McCallie 1904).

McCallie (1904) described the processes involved with Georgia coal mining around the turn of the twentieth century. The chief steps were excavation, removal from the mines, and preparation for market. Coal mining in northwest Georgia almost always took place underground, although Lookout Mountain had a single surface mine worked with contour stripping methods (Butts and Gildersleeve 1948:109). Mining districts that McCallie described indicated that they centered on prominent valleys cutting through coal-bearing strata. The valley walls exposed coal seams and provided entry points to the underground beds. Mine entrances consisted of adits cut directly into the ridge flanks (Figure 74). Although McCallie did

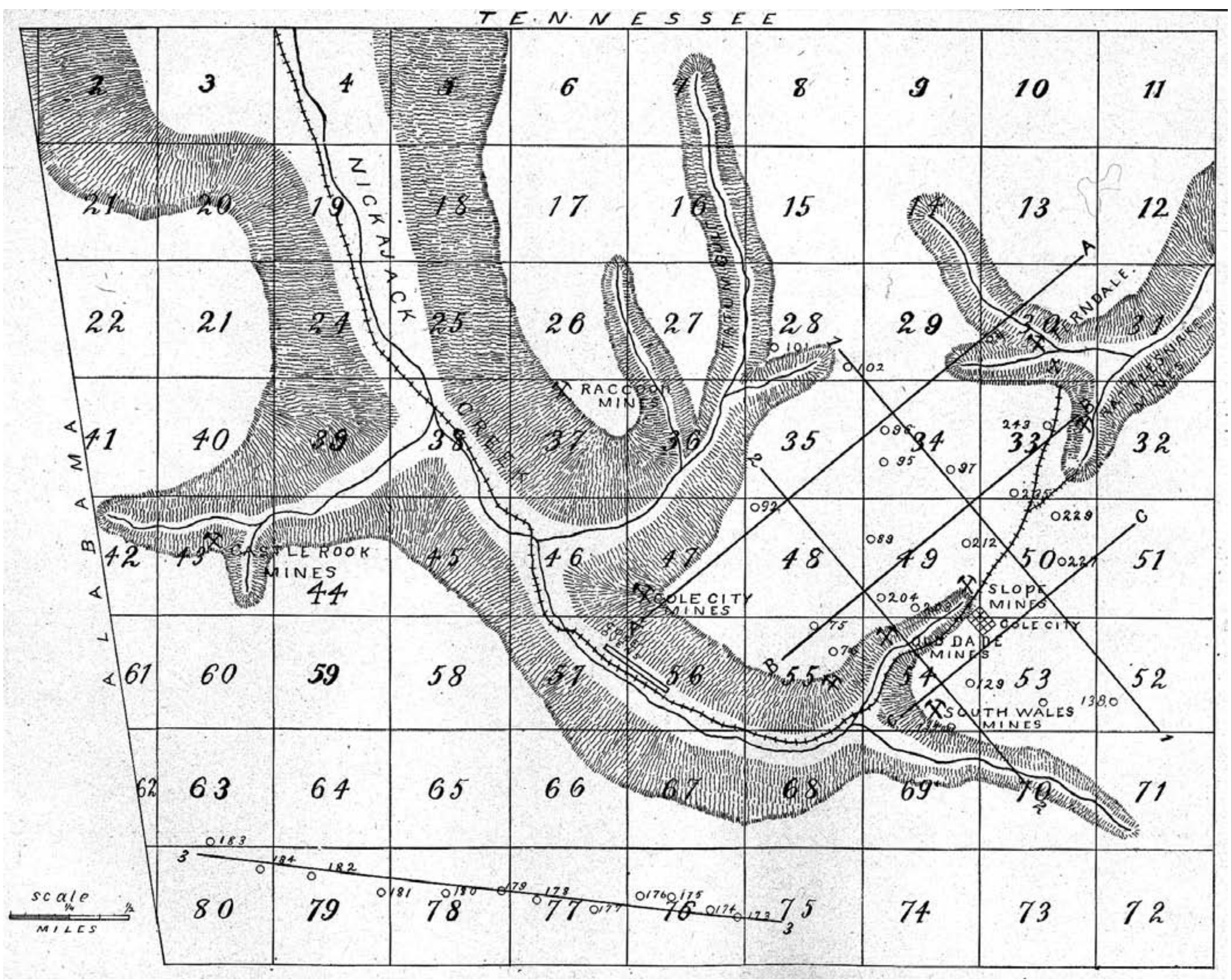


Figure 74. Map of the Cole City District showing the locations of mines opening at Nickajack Creek. Coke ovens were located in the valley bottom (Source: McCallie 1904).

not describe how Georgia miners extracted the coal, it is likely that the miners used the room-and-pillar system, the most common technique during the nineteenth- and early twentieth centuries (McVarish 2008:288). This method involved opening a series of rooms in the coal bed from several entrances and leaving columns (pillars) of coal to help support the roof until the room was mined out. As the miners moved back toward the primary entrance, the columns were taken out, allowing the roof to collapse. Another method that might have been used was the long-wall mine, consisting of one or more cuts driven deep into the coal bed to create a long wall or face, which was then mined working forward, the roof being supported with temporary artificial pillars (Mehls and Mehls 1991:18; McVarish 2008:288).

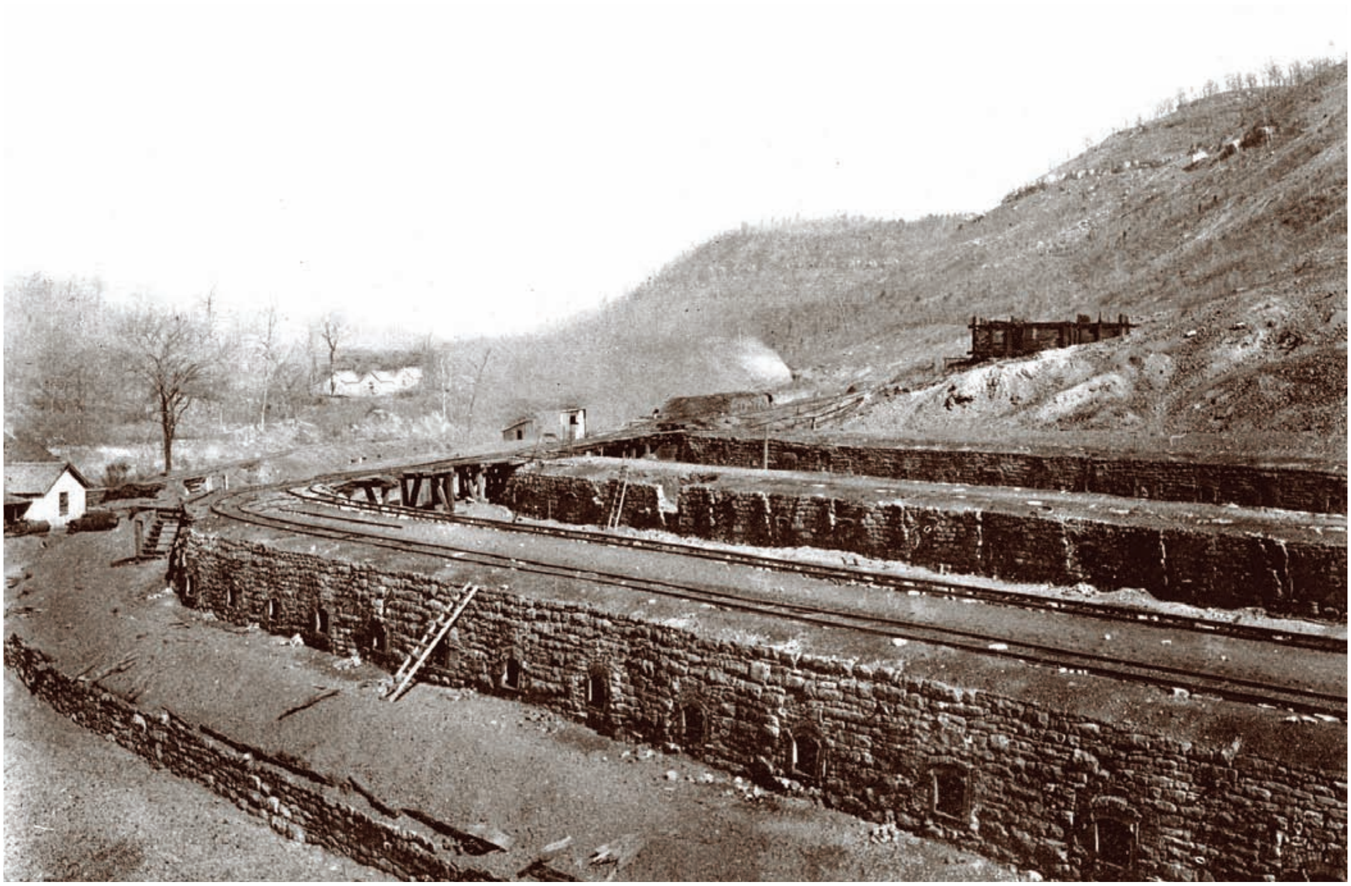
Early coal mining was performed by hand, and hand methods were certainly used in Georgia prior to the Civil War. Later in the nineteenth century, mechanical jackhammers and cutters, as well as explosives, became available, but it is not clear to what degree these were used in Georgia. As coal was broken free, workers loaded it into cars to be removed from the mine (see Figure 40a). Early mines probably used draft animals and manpower for this purpose. By the turn of the twentieth century, larger mines utilized small locomotives to carry the coal to the processing plant via narrow- or wide-gauge railroad (McCallie 1904).

Coal mined in Georgia around 1900 was primarily converted to coke, with some also sold for steam and other purposes (McCallie 1904). McCallie did not provide specific information about how the coal was handled after leaving from the mine except to say the adhering slate was broken up and loosened from the coal and the coal was then washed before going to the coke ovens (McCallie 1904:84-85). Coal was processed in washing plants to remove soil and waste rock before shipping. Separating the coal from waste rock was mostly performed with gravity methods in devices that operated on similar principals to jigs, described above.

At least two of the coal-mining companies operating in Georgia at the turn of the century manufactured coke. Coke consists of lumps of porous carbon produced by distilling bituminous coal. It was adopted as a fuel for blast furnaces in the U.S. by the middle of the nineteenth century and until the 1930s was usually made near the mines (Gordon 1996:49, 82; McVarish 2008:296). The process involved slowly heating the coal to drive off volatile constituents. By mid-century this was done in specially built beehive ovens constructed in long banks, sometimes set into a hillside to retain heat. The ovens were part of a complex that also included railroad tracks, loading areas, and other facilities (Gordon 1996:49-50). McCallie (1904, Plates 9 and 13) illustrated coke ovens associated with the Georgia Iron and Coal Company in Dade County and the Durham Coal and Coke Company in Chickamauga that were organized according to this basic plan (Figure 75).

These two companies operated mines on a relatively large scale. McCallie (1904) described them each as having coal washers; coke ovens; several small locomotives; machine, wood, and blacksmith shops; offices; commissaries; residences for company officials; miners' cottages; and barracks from convicts, who comprised the bulk of the labor force. It is not clear how common this type of arrangement was in Georgia, but coal mining undoubtedly had significant impacts on the landscape and, like other mineral industries in the state, should have clear expression in the built and archaeological environments.

Figure 75. Coke ovens of the Georgia Iron and Coal Company located in Nickajack Creek Valley, Dade County (Source: McCallie 1904).



VI. Property/ Resource Types

A first step toward interpreting and evaluating mining sites in north Georgia is to accurately identify the numerous individual cultural properties related to the extraction and processing of mineral resources. Precise identification is necessary to establish the historical and functional contexts of properties and therefore to evaluate their historic and archaeological significance. In addition, knowledge of resource types and how they functioned together can help delineate individual processes on sites with multiple or overlapping activities. Finally, correct identification can generate important data for studying historic mining industries, even when the site at hand lacks significance. The preceding descriptions of mining and mineral handling in Georgia suggest the wide range of activities that produced cultural resources and how they related to one another. The following discussion provides guidance for identifying specific resource types and linking them to particular mining processes.

Groups of resource types--features, objects, and structures--that functioned together in the extraction, processing, and shipping of mineral resources comprise what Hardesty (1988:9; 2010:16) called “feature systems.” The property types that comprise feature systems are also linked chronologically and they may encompass not only the mines and processing plants, but also the infrastructure, administrative, and community activities associated with mining. Feature systems thus constitute analytical units for understanding how individual and multiple resources related to one another and to particular processes (CALTRANS 2008:81).

CALTRANS (2008) provides an excellent reference for describing mining property types. Their types are divided into five categories: (1) prospecting and extraction; (2) ore processing; (3) intra-site ancillary features; (4) domestic remains pertaining to social, non-technical elements of mining; and (5) large regional linear properties that support the mining operation. With certain modifications, these five general categories are applicable to north Georgia. The principal changes are the addition of quarrying and handling quarry products to the “ore processing” category. Also, whereas CALTRANS was able to draw on relatively well defined, documented, and visible resource types, archaeologists and historians in Georgia have not always had these kinds of resources in mind when conducting surveys. As a consequence, the resource types proposed here for Georgia mining sites are more speculative and subject to revision as investigators go forth with an eye to identifying and studying them.

PROSPECTING AND EXTRACTION PROPERTY TYPES

Prospecting and extraction property types reflect the activities related to the discovery, assessment, development, and working of mines and quarries. An extensive range of property types fall into this functional category and the types can be divided and subdivided depending on the type and scale of mining involved. CALTRANS (2008) separated resources into types related to placer mining and those associated with hard rock/lode/vein mining. These different resource types produced distinctive and characteristic material remains, some of which might be distinguishable in Georgia.

PLACER MINING

In Georgia, property types associated with placer mining would mostly be related to gold mining, the only mineral industry to substantially exploit placers. Different resource types and varying morphology of types can be indicative of different time periods, technologies, and methods. Resource types that CALTRANS (2008:82) placed under placer mining included:

- Tailings piles, subdivided into small piles of placer tailings, oblong piles of placer tailings, long lines of placer tailings, pits with placer tailings, and surface exposures of placer rock;
- Cut banks, channels, and placer tailings;
- River diversion;
- Dredge tailings; and
- Drift mining remains.

TTailings piles are waste rock left from prospecting or mining. At placer mines, they consist of water-worn rocks with little soil located on creek drainages, along bars and riverbanks, or at locations of ancient exposed river deposits. They can be various shapes and sizes, depending on the methods and equipment that produced them. For instance, a tailing pile produced using a rocker would have an undulating ground surface composed of uniform-sized gravel and cobble deposits where the hopper was emptied. Long toms produced similar remains but the piles would be linear or oblong and measure up to 15-20 feet long, reflecting the longer apparatus used to separate the gold. Sluice boxes produced similar shaped but longer tailings piles (CALTRANS 2008:83-84) (see Figure 56). Of the mining features that might be found in Georgia, tailings related to placer mining along stream valleys may be the most difficult to identify. These features reflect a period when mining was relatively transient and small-scale, and there might be comparatively little documentation to help predict their occurrence in a given locale, as opposed to later mining operations. Surveyors should watch for linear piles of cobbles and pebbles as evidence of placer mining tailing piles in north Georgia.

On the other hand, activities related to prospecting and mining placers from older deposits in interstream locations might be more readily identified. Pits with placer tailings reflect small-scale prospecting. The associated landscapes tend to undulate with mounds and shallow pits and are located on hillsides, and ridges. Pits are less than 10 feet in diameter and have piles of cobbles and river rock adjacent to them. Numerous pits could be evidence that gold was found and the workings were expanded (a process known as 'coyoting'). Hydraulic systems would also produce visible archaeological features. These should include massive water runoff chutes and steep cut faces (Figure 76). Features such as ground sluices cut into bedrock should also exist (CALTRANS 2008:85, 87). Webb and Norman (1998:143) documented a hydraulic cut at the Sixes Mine (9CK537) in Cherokee County. This example (Feature HF-1) consisted of a V-shaped gash on a ridge flank measuring 155 feet long and 30 feet wide at its widest point.

Features identified as prospecting pits have been documented frequently in Georgia and historical sources reference prospecting pits (also referred to sometimes as gopher holes) and their use to identify mineral deposits in the state. Writing about this feature type as documented in Sumter National Forest, South Carolina, Benson (2006:153) said they often occur in small clusters, appear as shallow or sometimes deep oval or circular depressions, often have a discernible spoil pile around the perimeter, and typically occur within quartz outcrops. They are difficult to distinguish from old, large tree falls,

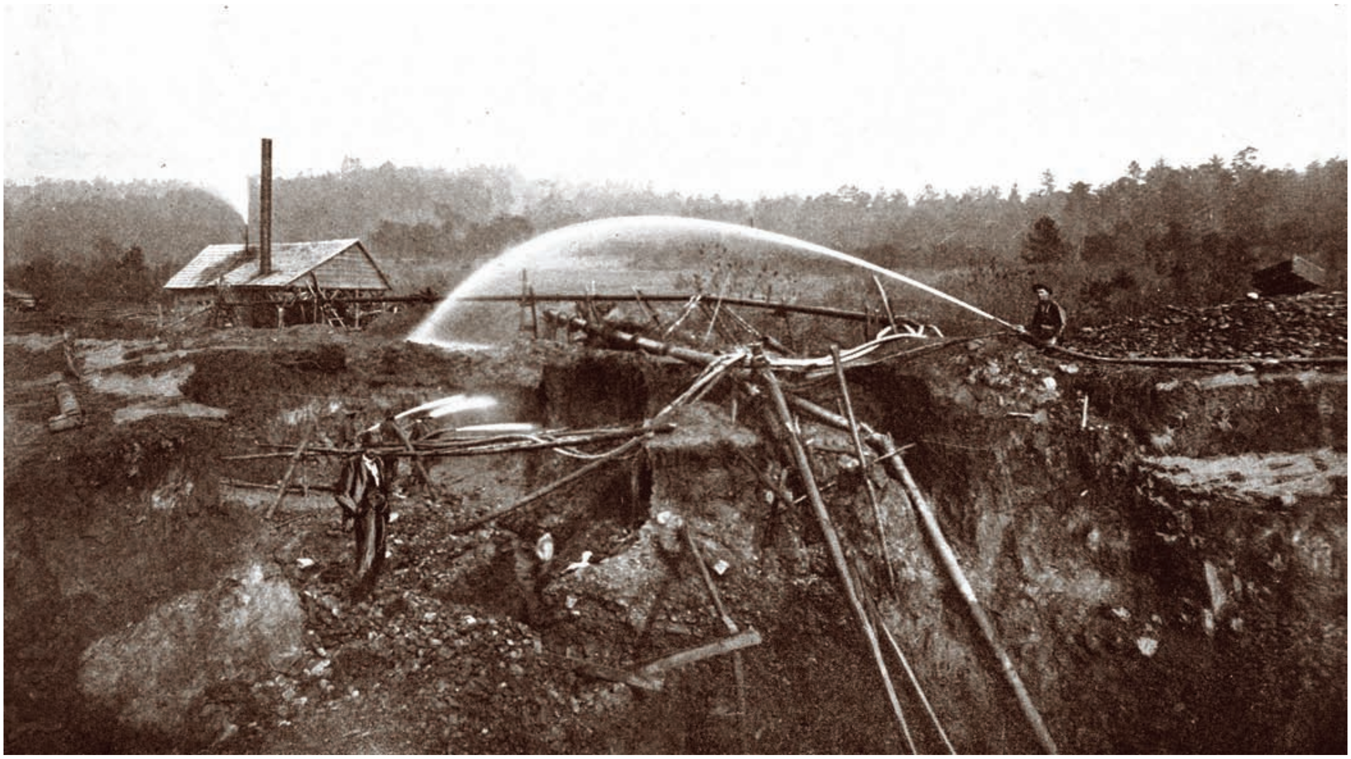


Figure 76. Hydraulic systems produced massive cuts and runoff channels. Yonah Company's placer mine, White County (Source: McCallie 1926).

unmarked graves, and military training foxholes. Similar features have been recorded in Georgia (Blick et al. 1996; Bruce and Wynn 1995; Ledbetter et al. 1987; Price 1994; Southerlin et al. 1994; Walling et al. 1992). In some instances, the pits were linear rather than round or oval shaped, and could measure between 15 and 50 feet (Walling et al. 1992). Numerous examples were identified on survey of 8,000 acres near Lake Thurmond in McDuffie County (Blick et al. 1996). Mostly described simply as "pits" or "pits with spoil piles," these occurred singly or in groups and were interpreted as possible mines or prospecting holes. One way to potentially clarify the identification of these features would be to look more closely at their settings, associations, and content. For example, checking the spoil piles might indicate if they reflect placer or hard rock tailings. Review of the geological mapping in Appendix 2 can be used to determine if there were mineral resources in the area that might have been prospected for. However, it should also be recognized that prospecting pits may appear in areas without mapped mineral resources as knowledge of where resources occurred was the purpose of these pits.

Drift mining involved burrowing underground to obtain placer deposits from landforms containing old riverbeds. Resource types would include waste piles of cobbles resembling placer tailings. Tunnels, adits, and shafts might have collapsed, but their presence might be projected from tailings locations. Traces of ore car routes might also exist (CALTRANS 2008:92).

Certain site types known in California, such as river diversion and dredge tailings, are not expected in Georgia. Some form of water management should be observable, however, because certain methods required the use of reservoirs that could be emptied to flush out gold-bearing deposits. These should be located adjacent to cuts and other hydraulic system features, and should be at a higher elevation in relation to them. In addition, channels and ditches necessary to fill the reservoirs might be present.

Although river bottoms were dredged for placer deposits in Georgia, the methods used differed from those in California and did not generate characteristic tailings on shore. It should be noted that while gravel and sand excavation in Georgia did deposit materials on land, these were the final products to be shipped and so remnants of these should have different morphology and locations than mine tailings. For instance, if sand were shipped, water worn gravel and rocks might comprise the waste products in tailings. These would be located away from the water, however, and more likely on an upper terrace were the sorting plant was located.

HARD ROCK/LODE/VEIN MINING

Extraction and handling of vein sources of ore produced distinctive resource types. This method of mining involved working primary rock deposits, often underground and required more complex and advanced technologies, as well as larger applications of capital. In addition, the minerals produced with this type of mining required further processing to separate the valuable ore from the waste rock. CALTRANS (2008:92) divided hard rock mining properties into six types:

- Small pits and surface vein workings;
- Waste rock piles;
- Shafts, adits, and inclines;
- Mills and other processing units;
- Underground workings; and
- Open pit mines.

Small pits and surface vein workings dealt with hard rock outcrops. Property types include pits with adjacent quarried rocks (not stream cobbles) or exposed host rock outcrops with excavated-out veins. Adits, shafts, and other evidence of mining and exploration might be found nearby. A small mill might also be present at larger operations to break and crush the rock (CALTRANS 2008:93).

The description of prospecting pits under placer mining applies here as well. Surveyors in north Georgia have recorded numerous pit features in upland settings and interpreted these as prospecting pits. These might represent efforts to find minerals worth mining. As noted above, additional effort can be put toward characterizing the setting and content of these features to obtain a better idea of their function and associations.

Waste rock piles consist of the host rock excavated from the mine that was immediately discarded near the mine site. Characteristic property types include piles of broken rock with little or no topsoil (see Figure 36). They should be visible as unnatural contours on hillsides, or as long, flat-topped ridges beginning at the mine portal and extending away from it (at larger mines) (Figures 77 and 78). They probably also mark the locations of mine shafts and adits, which would lie uphill from the pile and possibly be collapsed and no longer visible. Waste piles might be affected by post-deposition processes, such as re-working the material using different separation techniques, or robbing it for use as fill (CALTRANS 2008:94-95). Erosion may also obscure waste pile locations.

Shafts, adits, and inclines refer to elements of underground mines. The entrance to an underground mine is called a portal, which opens to either an adit or shaft. Adits, or drifts, are openings that run horizontally or nearly so to the lode, while shafts are vertical openings that extend to the lode deposit. Shafts can be identified as square, often caved in or filled, holes in the surface and may have footings for head frames and hoists around them. Adits typically lie on slopes and appear as collapsed trenches. Both types of features should have waste rock piles associated with them. If no waste piles are present, the openings might reflect air vents, drains, or other types of features. Additional features that might be associated with portals include evidence of transportation (tramways, paths), footings for hoisting, hauling, and power generating equipment, and remnants of wooden adit shoring or collaring at shaft openings (CALTRANS 2008:95-96).

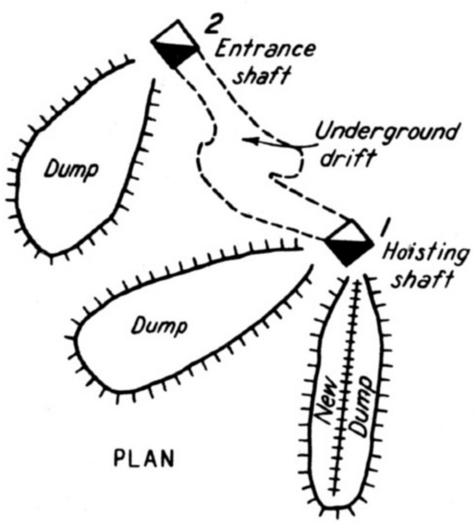


Figure 77. Plan of the Battle Mine (pegmatite), Monroe County, showing the location and shape of mine tailings (Source: Furcron et al. 1943).

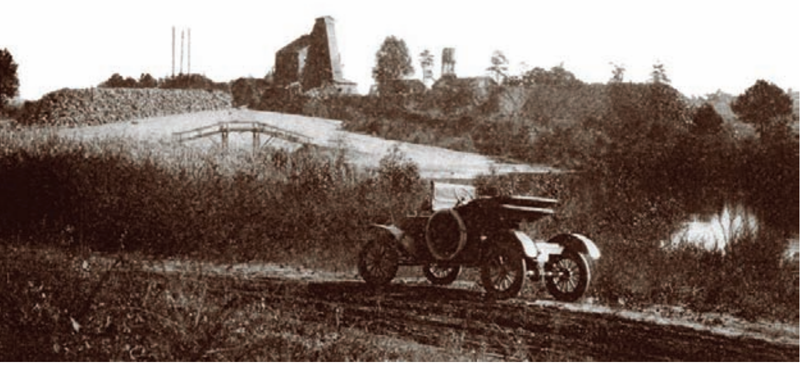


Figure 78. Tailings dump showing the characteristic linear orientation and flat-topped shape. Sulphur Mining & Railroad Company Pyrite Mine, Douglas County (Source: Shearer and Hull 1918).

The presence of shafts, adits, and waste piles would indicate the existence of underground mines. These features might also become exposed at mines where open-pit methods were used at the sites of earlier underground workings (Griffin 1974:19). CALTRANS (2008:96) specifically prohibits exploration of underground features, stating that they should be studied only with documents. This policy should be adopted in Georgia as well because the potential consequences of entering an unsafe underground mine would far outweigh any data gathered.

Archaeological sites identified as underground mines have been recorded in north Georgia. Webb and Norman (1998) identified several shafts at the Sixes Gold Mine site (9CK537). In addition, Hoffman et al. (1999) found linear rows of depressions they interpreted as collapsed tunnels at Site 9BR88 in Bartow County. A shaft feature was also observed at this site, which was assumed to be a gold mine. Adits and shaft openings have also been recorded at 9LU193 and 9LU201 (the Calhoun Mine), both of which were associated with gold mining in Lumpkin County. The adits at 9LU193 had been stabilized in the late 1930s and contained remains of support timbers, evidently made from railroad ties, as well as metal trackways for ore cars and a winch system for hauling them. Although this mine was opened during the nineteenth century, the 1930s improvements were apparently part of an investment swindle (Knapp et al. 2008). Therefore, the modern

Figure 79. Open pit mines should exhibit means of removing materials, such as hoisting equipment, roads, or rail access. Dupont Barite Mine, Bartow County (Source: Hull 1920).

components of this mine might not reflect actual practice. Another mine where numerous features associated with underground mining were recorded was Site 9BR1066, reflecting the Mansfield Mine. Survey of this site, associated with iron mining in the Cartersville District, identified 19 "prospect shafts," 20 adits, and 21 ventilation ducts (Pappas 2006). Although not recorded as individual archaeological sites, shafts and tunnels were included as contributing structures to the NRHP-listed Pine Mountain Gold Mine in Douglas County (Hebert 2006).

The best-documented lode mines in the state are those of the Blankets Creek Gold Mine Complex (9CK465) in Cherokee County. The Allatoona Lake Manager's Office (1996) documented four shafts and four adits here before filling them for safety purposes. The shafts measured between eight and 10 feet in diameter and reached extant depths between 14 and 22 feet. Adits measured from 3-5 feet wide, 4-7 feet high, and reached lengths between 60 and 205 feet. Drifts, or side-tunnels opened from the interior of three of the four adits. No drifts were identified in any of the shafts at this site.

Open pit mines and quarries should be relatively easy to identify. As indicated in previous sections, these operations involved systematic development and extraction of the mineral resource and the organized manner of working them should be observable in such elements as stepped walls and vertical working faces. As with underground mines, there should be waste rock piles and evidence of transportation, hoisting, and other equipment for accessing the works. In some instances, the open pit might have openings for trams or roadways (Figure 79). At twentieth-century mines where excavation was done with mechanical excavators and hauled with trucks, roads, machine shops, and garages might be present as well (CALTRANS 2008:97). Although they might leave very clear surface remains, open mines could become obscured by caving and slumping, making them more difficult to delineate. Additionally, some mine operators, particularly the New Riverside Company in the Cartersville area, practiced a form of reclamation by refilling pits after they were played out (Gray 2003:253).

These types of features are commonly recorded in north Georgia. An example of these was Site 9GI131 in Gilmer County, which consisted of a linear trench dug into a ridge flank measuring 130 feet long with an expanded area 100 feet across at the uphill end. The maximum depth was 20 feet. No artifacts were found and no other features were recorded at the site, which was interpreted as a possible mica quarry (Walling et al. 1992:72). This feature appears to represent a clear example of an open pit mine or possible borrow pit. The lack of associated artifacts and features could reflect a relatively transient mining operation.

Webb and Norman (1998:115) identified numerous open pits at the Sixes Goldmine (9CK537), which they interpreted as evidence of "rathole" mining.

These were typically circular or semi-circular and measured from 3-25 feet in diameter and reached depths between one and 16 feet. Webb and Norman also recorded a number of linear features they called "open trench excavations," consisting of linear or semi-linear and ranged from 17 to 149 feet long (Webb and Norman 1998:126). The report does not make it clear if the features reflect mines, drainage, transportation, or other functions. At the LaBelle Gold Mine (9CK1142), Jordan et al. (2003) found similar pit and trench features. They identified open pits used for excavation by their association with ore veins. They acknowledged the ambiguity of open trenches, saying they "were utilized for water transport, waste removal, and ore extractions, but may have served other less clearly defined functions as well" (Jordan et al. 2003:172). Jordan et al. (2003:172) noted that trenches reflecting excavation activities would follow veins of ore.

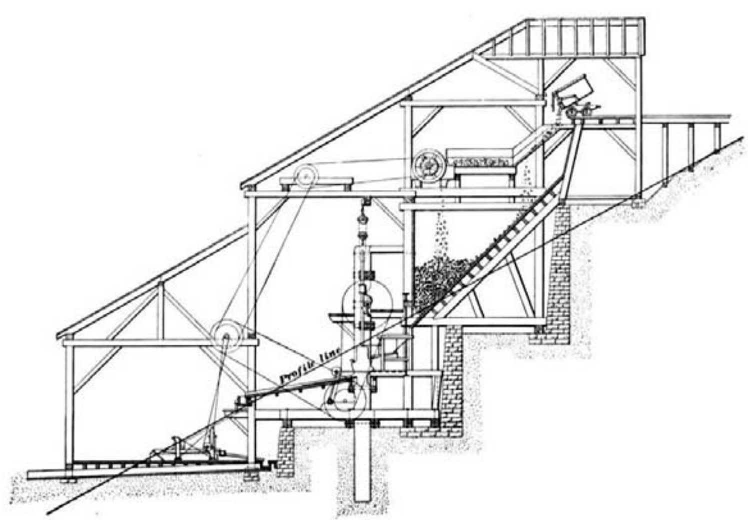
PROCESSING

Processing refers to the preparation of minerals for market. In the case of ores, processing would include the various steps of beneficiation. For rocks, it would involve shaping, crushing, and sorting, depending on the product, while clays, sand, and gravel went through yet other processes. The different ways of treating minerals varied in complexity and location, depending on product, time period, technology, individual operators, and other factors. Based on preceding overviews of mining and quarrying practices, the property types related to processing in north Georgia include mills and mill tailings.

There could be considerable variation in mineral processing plants. Extant processing structures are rare, given their specific uses, the salvage and relocation of equipment, and the passage of time since mining activities ceased. Photographic evidence of these structures indicated a range in scale, from simple sheds that provided shelter for equipment and activities to massive plants having solid stone or cement foundations to support heavy machinery. Milling plants of all sizes, as well as supporting buildings and structures, were nearly always wood frame. Because the equipment used for breaking and crushing rock was so heavy, foundations and footings should be relatively large and solid. This is particularly true for older operations, where gravity was employed to move materials through the process. These plants required heavy equipment to be placed in upper stories of the mill and so required substantial foundations (Kantor and Saeger 1939:76-77; Noble and Spude 1992:12). In addition, mills were often placed on or adjacent to a slope to take advantage of natural contours for loading and support (see Figures 80 to 82).

Interior arrangements of these buildings should reflect an orderly progression designed to move ore through the successive processes of beneficiation. If equipment was removed, or if the entire structure was demolished, then building foundations, machinery mounts, and footings might indicate the interior

Figure 80. Ore mills and processing plants were often built on slopes to use gravity to move the product forward as well as to provide solid footings for heavy equipment (Source: International Library of Technology).



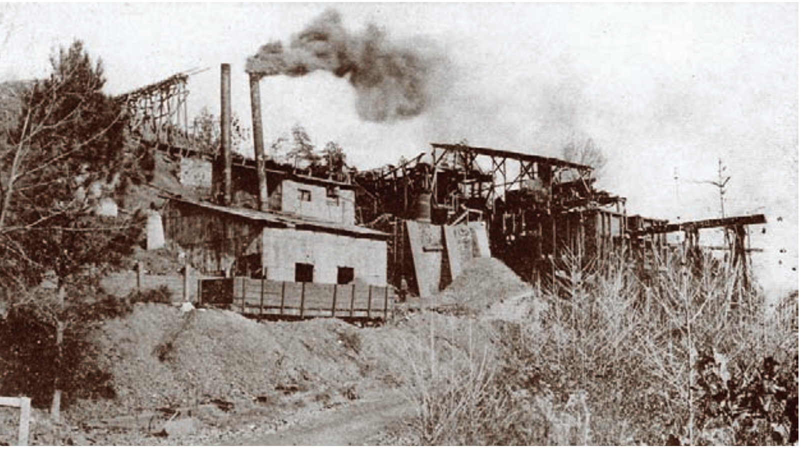


Figure 81. The Mathews Iron & Steel Company Washing Plant, Bartow County, illustrates the use of natural contours in plant layout (Source: Haseltine 1924).

buildings to support heavy crushing and classifying equipment. These later plants might also have belowground passages for conveying materials between the mill, storage bins, and loading areas.

The locations of mills and processing facilities varied with respect to mines and quarries. While they might be adjacent or nearby, they could also be located in central locations to service multiple extraction sites (CALTRANS 2008:99). Moreover, twentieth-century mines might be associated with processing facilities located a considerable distance away, such as in the case of the Dickey Clay Manufacturing Company, which shipped clay and shale excavated near Rome, Georgia, to plants in Tennessee and Alabama in the 1920s (Smith 1931).

Figure 82. Processing plants, or portions of them, might be elevated on piles to enable gravity in moving materials. Section House Mine concentrating mill (Barytes), Bartow County. Note the mill tailings and log retaining wall to contain them (Source Hull 1920).

In sum, property types that reflect mills are expected to include large buildings or building remains, often on hillsides (which might be terraced), with heavy foundations and footings. If buildings are no longer extant, various pads and machinery mounts would represent support structures and equipment locations. A water source and means of transporting ore to and from the mill may be present. The spatial arrangement of these features should reflect the use of gravity, or later belts and cranes, to move materials through the plant.

Tailings could also indicate processes and organization of activities. For instance, larger waste rock would be expected near the upper levels of the plant where picking took place while mill tailings would be at the lower levels of the plant where concentrating was done (CALTRANS 2008:99).

To date, two ore processing sites have been recorded with structures in Georgia. One of these, the NRHP-listed Pine Mountain Gold Mine in Douglas County contained a group of structures and features associated with a nineteenth- to twentieth-century operation. This property included several contributing structures, including a water reservoir, cyanide tanks, leaching tanks, sump tanks, and ore stacking bins. The property also contained various structure remains and features that represented the landscape of a historic mining complex (Hebert 2006).

A second mine site with structures is the Calhoun Mine (9LU201), a nineteenth-century site containing two structures built in the late 1930s when the early gold mine was supposed to reopen. One structure might have been intended as a bunkhouse, but was modified in the later twentieth century and its original function is not known. The second structure was a stamp mill built in 1939. As noted above, these structures relate to a financial scam and may have been intended to fool potential investors (Knapp et al. 2008). The structures cannot be viewed as necessarily representative of gold mining operations of this time.

Only one ore processing plant has been documented archaeologically in the state. Jordan et al. (2003) identified and exposed components of the stamp mill at the LaBelle Gold Mine (9CK1142). Excavation revealed the footing for a structure (Feature 64) made of massive (21-inch square) wooden beams. Iron bolts extending vertically from the beams served to anchor equipment. The structure was made more stable by packing the frame with small rocks and dirt. No evidence of the superstructure or stamps were found. Immediately next to the feature, there was a cut area in the ridge slope that suggested terracing (Jordan et al. 2003:197, 222-224). Terracing a slope would be consistent with a mill arranged to make use of vertical processing of the ore. Moreover, creating terraces would have provided stable ground to support the heavy milling equipment.

Iron furnaces are one type of processing structure that is more likely to have survived, due to their size and masonry construction. As discussed earlier, iron furnaces are truncated pyramids with four openings at the base. A number were present in the Etowah River valley and an extant example, the Etowah or Cooper's Furnace, can be seen below the dam at Lake Allatoona. Other furnaces that have been recorded include the Stamp Creek and Allatoona Furnaces (Jordan and Huddleston 1998) and Donaldson's Furnace (Joseph and Reed 1987) (Figure 83).

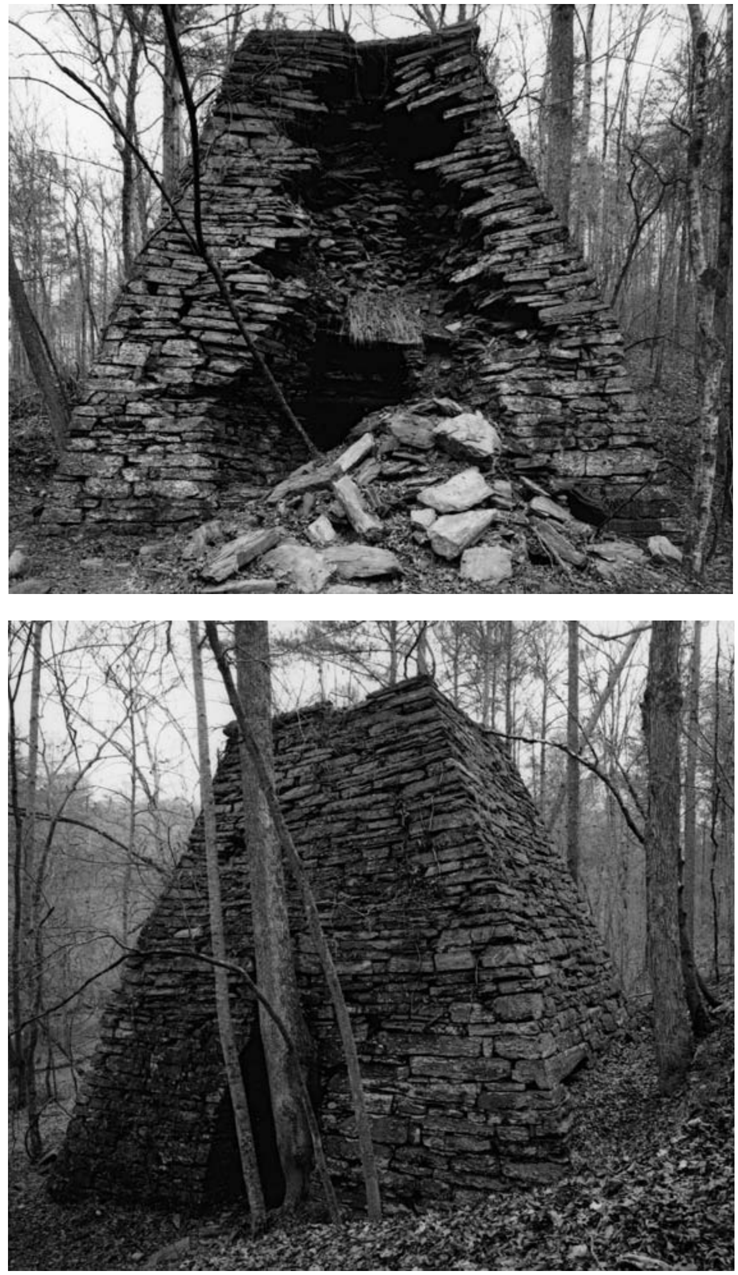


Figure 83. Two views of Donaldson's Iron Furnace, Cherokee County. Ore would have been loaded at the top of the furnace and the molten ore extracted from the front (in this instance collapsed) opening. Photographs by Richard T. Bryant.

The scope of this study covers varieties of mineral industries with specialized processing, and therefore researchers in Georgia can expect to find feature types reflecting these other methods and technologies. A partial list would include settling tanks for clay industries, storage areas, stockpiles, and sub-grade conveyor systems at sand, gravel, and crushed rock plants. In addition, as conveyor systems developed in the twentieth century, plant buildings might exhibit less heavy construction and be spread over larger areas. At such mills, the waste rock and mill tailings would indicate the locations of preliminary and final processing and so would suggest the overall mill arrangement.

Another type of processing feature that CALTRANS (2008) identified for California is the arrastra. Yeates et al. (1896) mentioned their use in Georgia in the gold industry, but it is not known if they were common in the state. These features would be indicated by shallow, flat-bottomed circular depressions. They were normally less than 20 feet in diameter and lined with stones on the edges and floor (CALTRANS 2008:98).

Mill tailings constitute a distinctive type of feature associated with mining landscapes. Tailings reflect the waste portion of the ore discarded after the valuable materials were extracted. They were usually finely crushed and in the form of slurry that was allowed to run off into creeks and ravines near the mill (CALTRANS 2008:102). It is not clear how mill tailings were handled at Georgia mines, although by the 1910s, at least some mineral industries used settling and mud ponds to keep runoff from entering streams (Hull et al. 1919:261). Property types reflecting retention ponds consist of broad, meadow-like formations. The soils within them would be fine material with color and vegetation that was distinct from the surrounding soils (CALTRANS 2008).

ANCILLARY MINING PROPERTY TYPES

Ancillary structures and features that comprised elements of a mining operation included the infrastructure directly related to mining as well as housing, external transportation facilities, water management structures, and others (Noble and Spude 1992:14). CALTRANS (2008) divided these diverse property types into three broad categories: ancillary types, mining community types, and inter-site support types.

The three classes of ancillary mining properties include: structures, site-specific transportation features, and site-specific water conveyance systems. These features reflect site-specific internal components that assist in mining and milling (CALTRANS 2008:103).

STRUCTURES

Structures, or structural remains, include buildings related to mining and milling operations. Specific functions might be identifiable by documentary sources, artifact content, construction techniques, and/or location. Functions or structure types that are placed into this category include offices, changing rooms, blacksmith/mechanic shops, cooperages, sheds/stores/warehouses, garages, and stables (Noble and Spude 1992:14; CALTRANS 2008:103). Mine sites in operation over a long period of time might have more than one of a particular structure type as a result of replacement, moving buildings, or rearrangement of the site. In the absence of extant structures, archaeological remains would most likely consist of foundations and artifact scatters associated with the mine or mill (CALTRANS 2008:103-104).

TRANSPORTATION FEATURES

Site-specific transportation features include trails, roads, and tramways used to move ores, waste rock, people, and equipment around the mine site. Roads were always present at mines, while other transportation features were optional, depending on the type of mine, scale of operations, and other factors. Physical manifestations of these systems consist of linear, continuous grades leading to main areas of the mine or mill. Tramways would be distinguished by uniform grades, possibly trestles, and rails and ties, which might be removed after the mine closed. Aerial tramways with buckets or gondolas would be represented by cables, head frames, and buckets (CALTRANS 2008:104). Another transportation feature that came into use during the twentieth century consisted of belt conveyors and overhead cranes for moving materials between buildings and around the mill yard (Kantor and Saeger 1939:77). Conveyor belts required footings or solid mounts, which should be distinguishable by being aligned with one another. Overhead cranes were mounted on sidewalls or elevated pillars that should be wide apart and parallel to one another.

WATER CONVEYANCE SYSTEMS

Water was an integral element of nearly every kind of mining and had to be available as long as the mill or processing plant operated. Features related to water supply included reservoirs, cisterns, and tanks, which would typically be located uphill of the mill to permit gravity feed. Ditches, pipes, and penstocks moved water through the mining site and plant, while drains removed spent water from the area (CALTRANS 2008:105). Remnants of these systems might include earthen berms, ditches, and channels. In addition, footings for aboveground water tanks, penstocks, or other conveyance structures could exist.

MINING COMMUNITY PROPERTY TYPES

Mining community property types include domestic residential activities of miners, mine-support staff, and their families. It is presently unknown how often residential activities were associated with mining operations in north Georgia. They did occur, however, and varied from the communal shanties occupied by miners during the gold rush to the barracks put up for leased convict laborers used in the northwestern Georgia coal mines (McCallie 1904; Williams 1993:97).

Mining communities were often transient but were distinctive. Associated property types can be classified into three groups: domestic structural remains (including service buildings), domestic artifact deposits, and domestic landscape features. To be considered a residential site associated with mining, the domestic property types must be physically and historically associated with the mineral industries and must exhibit one or more of the following attributes:

- They must have quantities of domestic artifacts,
- They must contain distinctly domestic features such as hearths, or
- Documents should identify them as domestic-residential structures (CALTRANS 2008:106).

DOMESTIC STRUCTURE REMAINS

CALTRANS (2008) and Hardesty (2010) described the types of structures and related archaeological remains expected in mining communities of the western United States. It is not known how well these apply to Georgia, but future research should be able to characterize trends. In general, the simplest houses for miners were tents and lean-tos,

Figure 84. Some mining operations included housing for workers. Mining camp at Estelle, Walker County (Source: McCallie 1908).

with improved housing consisting of full or partial enclosures with walls of logs, lumber, or fieldstone and a canvass roof. Still other shelter varieties would consist of partially subterranean pits or enclosures dug into hillsides. These simple structures were mostly associated with early mining and most likely would relate to placer mines. These structures would be located near the mines and might include earthen pads (raised or obviously prepared in some way), foundations (pier or perimeter), dugouts (squared pits cut into the ground or slopes), hearths, drainage features, and sheet refuse or sparse scatters of domestic artifacts. Structures 30 feet or more in length could represent barracks or dining halls, which would be further distinguished by the presence of large refuse deposits containing tablewares, food containers, and faunal remains (CALTRANS 2008:106-108).

Some authors describing mining in Georgia (e.g., McCallie 1904; Hull et al. 1919) indicate the presence of houses or miners' cottages. Although their construction is not certain, these might have represented more substantial and permanent structures than some of the types described for the western states. A photograph of a mining camp near Estelle in Walker County shows a group of small, one- or one-and-a-half story houses built according to the same general plan, with one chimney each and rear shed rooms (Figure 84). Where such structures are no longer extant, archaeological remains might include more obvious foundations or piers with substantial chimney mounds. Brick, nails, and window glass might be more prominent among the construction materials.

Thus far, only one mining site in north Georgia has produced evidence of domestic occupation. At the LaBelle Gold Mine (9CK1142), Jordan et al. (2003:197, 217-222) exposed features they interpreted as a structure measuring approximately 30x15 feet that had a chimney and produced a number of domestic artifacts (Feature 52). Domestic artifacts were also recovered elsewhere on the site, suggesting residential activities, although no other house remains were recorded.

DOMESTIC ARTIFACT DEPOSITS

CALTRANS (2008:109-110) characterized the artifact deposits associated with mining residential sites as sheet refuse and filled features. These would resemble those at any domestic site. Sheet refuse occurs in the vicinity of a dwelling and reflects materials discarded or lost on the surface by site residents. It might occur throughout the living area of a dwelling or adjacent to and downhill from the dwelling area. Filled features, or "hollow-filled features" consist of concentrated artifact deposits reflecting disposal into features such as trash pits, cellars, prospects, privies, or other abandoned subsurface openings.

DOMESTIC LANDSCAPE FEATURES

Landscape features associated with mining sites generally fall into two groups: plantings and stonework (CALTRANS 2008:110). Plantings reflect the efforts of mining households to create domestic environments featuring vegetable and ornamental gardens. Features reflecting planting holes and beds might be discernable archaeologically and in some instances, plants might remain growing at the site. Domestic landscape features could also include paths, retaining walls, and terraces. Reference to the mining camp at Estelle suggests the domestic landscapes of miners' housing were relatively simple and contained little other than what was needed for transportation and basic human needs (see Figure 84).

INTER-SITE MINING SUPPORT PROPERTY TYPES

CALTRANS (2008:110) described inter-site mining support properties as "separate, distinct sites that may extend many miles, creating a link between the mining site and the outside world. They represent linear systems for delivery of services or access and are recorded as individual and distinct entities." They were linked to particular mining sites, however, and should be viewed as functional elements of those sites. Resource types included in this category include inter-site transportation features, inter-site water conveyance systems, and inter-site utilities.

INTER-SITE LINEAR TRANSPORTATION FEATURES

Transportation features connecting mines to the outside in Georgia consist mainly of trails, roads, and railroad sidings and spurs. Although some minerals were dredged from rivers and riverbanks, transportation over long distances by water was rare in the state (Teas 1921:97). Early transportation routes in the mining regions were likely rough trails. Williams (1993:89-90) described the gold mining region around the 1830s as a frontier area with large expanses of undeveloped and unpopulated land and having few roads, most of which were of poor quality. CALTRANS (2008:111) described early mining trails as narrow and often having downhill retaining walls on hillsides. More formal roads for wagons and, later, motor vehicles replaced the trails. These were wider, less steep, and ultimately improved with various paving methods. Improved roads were particularly associated with larger capitalized operations.

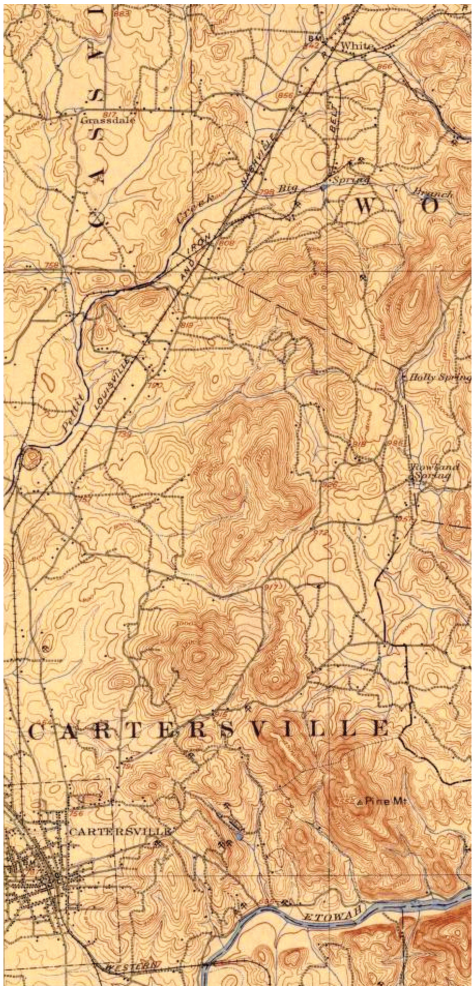


Figure 85. Railroads were integral to Georgia mining. The Iron Belt Railroad was built specifically for mining and ran from Cartersville to Pine Log Mountain (Source: USGS 1906).

Railroads were significant components of mining sites in Georgia, and later mines were sometimes situated to take advantage of their proximity. Often, larger mines built small- or regular-gauge railroads to haul materials to the main depots (Figure 85). It is reasonable to assume that these would resemble standard railroads and have the same components of rails, fasteners, ties, ballast, and built sub-grade, trestles, and other features. Railroads associated with mining sites, however, might also include special loading facilities, such as elevated tipples above railroad lines to dump ore directly into cars (Figure 86).

INTER-SITE CONVEYANCE SYSTEMS

Water was necessary for mining and especially ore processing. Identifying the source of water for a mining operation would be important for understanding the mine's history and interpreting its development (CALTRANS 2008:111). Hydraulic mining systems in Georgia used elaborate canal and ditching systems to bring water to the site-specific reservoirs. These systems were notable for their length and substantial features. The Hand and Barlow ditch in Lumpkin County, for instance, reached nearly 35 miles in length, crossed the Yahoola Valley in a 2,000-foot long, three-foot diameter pipe supported on stone piers, and had numerous auxiliary ditches that various mines used to draw water (Nitze and Wilkens 1896:743) (Figure 87).

Figure 86. Elevated tipple used to load railroad cars. Raccoon Coal Mine, Dade County (Source: McCallie 1904).

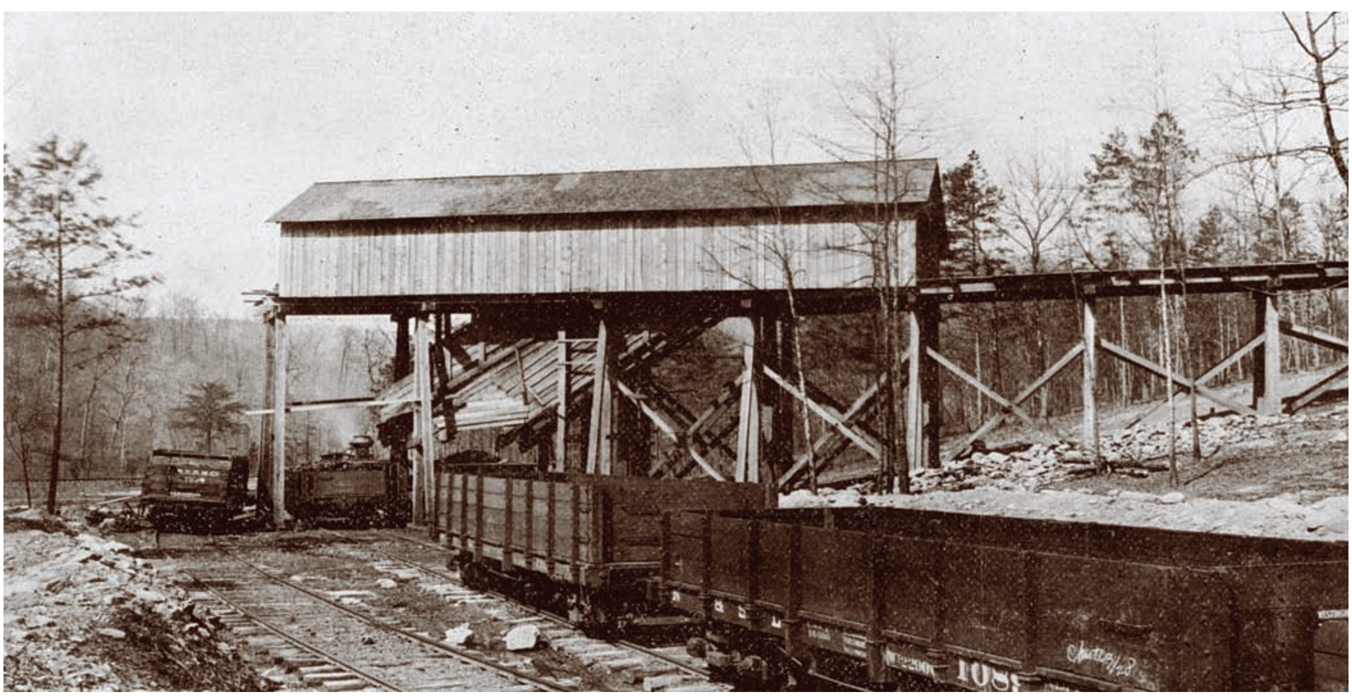


Figure 87. Hand and Barlow ditch line crossing the Yahoola River near Dahlonega (Source: Bremer 1896).

These systems should have distinctive archaeological remnants that can be linked to particular mines or to mining in general. Components of inter-site water conveyance were ditches/canals, flumes, reservoirs, and pipes. Ditches and canals would be excavated across the landscape, following contours, and often have berms on downhill sides that might be reinforced with rock. Flumes were often made of wood and most likely would no longer remain extant, although their remains might include stone or concrete footings in line with a projected water delivery system. Remains of gates, pipes, or penstocks might consist of metal and poured concrete structures, but large metal components of these were likely salvaged for scrap. Reservoirs and other water control structures were typically stone or earth and lay upslope from the mine or mill, with the water being delivered via penstocks (CALTRANS 2008:112).

Wynn's (1989) survey in the Chattahoochee-Oconee National Forest resulted in the identification of a possible water conveyance feature (Site 9LU29) in Lumpkin County. The site consisted of a shallow ditch segment whose ends were outside the survey area. The segment recorded for this survey measured approximately 1.25 miles long, about three feet deep and six feet wide. Its termini were outside the survey area, but Wynn reported they extended for many miles. Where it crossed small streams, wooden structure remains were interpreted as aqueducts (Wynn 1989:10-11). The length of this feature conformed to descriptions of the extensive water systems used to supply hydraulic mining systems in the region.

INTER-SITE UTILITIES

Power generation was important in the operation of mining operations. Many plants had generated their own power to run site-specific operations. By the twentieth century, however, mines and quarries operating near urban areas might have had access to municipal power as well as telephone service. Under this category of property type, CALTRANS (2008:112) listed utility poles and glass and ceramic insulators as identifiable features.

VII. National Register of Historic Places Evaluation of Georgia Mining Sites

This historic context deals with properties related to mining and quarrying in north Georgia. Previous sections of this document described the history of north Georgia's mineral industries, the processes involved in extracting and handling mineral resources, and the types of properties expected to result from these processes. In addition, this document has reviewed cultural resources documentation and studies dealing with the state's mine and quarry sites. This chapter provides guidelines for the National Register of Historic Places evaluation of mining sites in the state.

NORTH GEORGIA MINING PROPERTIES: HISTORIC CONTEXTS AND AREAS OF SIGNIFICANCE

Historic contexts are patterns or trends in history that provide a framework for understanding a specific occurrence, property, or site. They provide a means for relating specific sites to broad historical patterns and thus interpreting their meanings and evaluating their significance.

This context refers to the historical, technological, economic, labor, and cultural developments related to extracting mineral resources and converting them to commodities. The mineral industries included in this context ranged from relatively small-scale gold mine workings to industrial mining and quarrying operations. These industries had important impacts on north Georgia, although, save for the gold rush era of the 1830s to 1840s and the granite industry of Stone Mountain and Elberton, the effects of the mineral industries of the region are not widely known. The gold rush significantly influenced the region's settlement and landscape. The manner of organizing land distribution was directly influenced by the presence or absence of gold, while various methods of mining this precious metal substantially altered the landscape, removing and redistributing massive amounts of soil and producing extensive water-supply systems. Gold mining also gave rise to towns and settlements in and adjacent to the northern part of the state. Other industries, while less celebrated, took advantage of rich and varied mineral resources to produce numerous commodities, some of which, like marble, were widely distributed in the United States. Mining was so intense in some districts, such as the area around Cartersville that it contributed to distinctive economies, landscapes, and social relations. This historic context thus focuses attention on the unique contributions of these industries to the history and development of north Georgia.

Historic contexts can encompass one or more "themes" or "areas of significance." The National Park Service (1990) defined a theme as a means of organizing sites into coherent patterns based on certain concepts or subjects, such as environment or technology, that have influenced the historic or cultural development of a region. A theme is considered significant if it can be demonstrated through scholarly research to be important in American history. A single site could relate to more than one theme. For the north Georgia mining industries context, significant themes or areas of significance include:

Figure 88. Assessing integrity of mining properties requires consideration of the complete system of producing mineral resources. Even open cuts were scenes of considerable activity. To have integrity, structures like these should have some remains of the associated features and activities and convey a sense of how they related to other processes at the mine. Tucker Hollow Mine (Barytes), Bartow County (Source: Hull et al. 1920)

- Archaeology;
- Commerce;
- Community Planning and Development;
- Economics;
- Engineering;
- Ethnic Heritage;
- Exploration/Settlement;
- Industry;
- Invention;
- Labor;
- Landscape;
- Science;
- Social History; and
- Transportation.

NRHP CRITERIA FOR EVALUATION

The significance of historic properties is judged with respect to the NRHP criteria. In addition, sites must be assessed in light of their relationship to historic contexts. Finally, a site's NRHP eligibility is a function of its integrity or its ability to convey its historic significance. In other words, it must not only be a good representative of its historic context, but must also be in a condition that clearly demonstrates its relationship to the context.

The four NRHP Criteria for Evaluation require that districts, sites, buildings, structures, and objects possess integrity of location, design, setting, materials, workmanship, feeling, and association, and meet one or more of the criteria of evaluation:

> Criterion A refers to properties that are associated with events that have made a significant contribution to the broad patterns of our history;
>
> Criterion B covers properties that are associated with the lives of significant persons in the past;
>
> Under Criterion C properties must embody the distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction; or
>
> Criterion D deals with properties that have yielded or are likely to yield information important to prehistory or history.

The following sections describe the procedures for evaluating north Georgia mining sites with reference to their historic contexts and integrity.

INTEGRITY

Integrity is an extremely important concept in determining historic significance. It refers to the ability of a property to convey its association with a particular historic context. There are seven aspects of integrity: location, design, setting, materials, workmanship, feeling, and association. The NRHP criteria stipulate that a site must possess at least several or most of these aspects. Which of the aspects of integrity a site mush have and how important each one is in evaluating a particular site depends on the nature of the site itself and why it might be significant (National Park Service 1990). For historic mines and quarries, it is important to consider not just individual properties, but the entire mining or quarrying system and assess its degree of intactness and visibility. An ideal site for the NRHP would have clear representations of the processes of extracting minerals and processing them, along with evidence of auxiliary activities such as transportation, water supply, power supply, and possibly administration and residential areas. Additionally, it should be possible to relate these resources to specific historic contexts or themes. Sites that only retain one aspect of the mining process or have been reworked so often that individual features cannot be related to one another or to a historic period have poor integrity (Figure 88). However, if clear physical evidence of a complete system remains discernable, damage or loss of some parts of it may not eliminate overall integrity (Noble and Spude 1992:21).

Historic mining properties can also be viewed as historic rural landscapes. Therefore, qualities of integrity as they apply to this kind of resource can also be considered if a particular site or property warrants it. Assessing the integrity of a rural landscape involves considering the interrelationships between cultural and historical practices and aspects of terrain, vegetation, and other natural features. Historical landscapes retaining integrity would ideally exhibit preservation of, or continuity in, land use practices, transportation networks, boundary demarcation, responses to the environment, and/or other characteristics. Components such as buildings and structures, vegetation, compatible land use, and others contribute to aspects of integrity. Conversely, substantial alternations to the land and components, or the additions of patently modern and incompatible elements, would detract from integrity (McClelland et al. 1999:22-23).

Factors affecting the integrity of mining properties in north Georgia include ongoing mining activities at single sites and land use practices. The nature and lifecycles of mining properties can make them particularly susceptible to loss of integrity and create challenges to discerning complete mining systems and linking them to historic contexts. Mining often involves substantially disturbing or obliterating earlier components; taking away, moving, and adding equipment and structures; and reorganizing space. Historic and modern land use in north Georgia also has a potential for degrading the integrity of historic mining properties. Whereas abandoned mining sites in western North America are often isolated and retain considerable portions of their historic fabric (Noble and Spude 1992), the more dense population and intensive land use in north Georgia led to encroachment on former mining sites. Ultimately, abandoned or closed mining properties in the state are apt to have been dismantled for salvage and the land reused for other purposes, which can confuse interpretations of historic mining practices.

Keeping in mind what would constitute a high degree of integrity and the factors that can detract from it, archaeologists and historians can consider how the seven qualities of integrity relate to mining properties in north Georgia. These aspects are described below.

LOCATION

Location is the place where the historic property was built or the historic event took place. The relationship between the property and its location can be important for understanding why the property was created, and contributes to creating a sense of the property's association with historic events and people (National Park Service 1990). For mining and quarry sites, having integrity of location means the mine or mill remains in its original location.

Although a mine or quarry cannot be relocated, components of a mining operation could be and the timing and associations of such moves must be considered in assessing integrity (Nobel and Spude 1992:19). For historic rural landscapes, the integrity of location refers to the geographical factors that influenced settlement and development. Assessing integrity should consider whether these geographical features are still present and evident (McClelland et al. 1999:22).

DESIGN

Design refers to the combination of elements that create the form, plan, space, structure, and style of a property. It reflects deliberate choices made during the original conception and planning of a property (or its significant alteration). A property's design manifests historic functions and technologies as well as aesthetics (National Park Service 1990). Mining sites can be viewed somewhat differently because expansion and alteration of the extraction sites, mills, and other features were normal parts of a site's lifecycle. Consideration of integrity of design must therefore look at the site's original layout as well as its ability to illustrate its evolution through time. In addition, to have integrity of design, a mining or quarry site should have enough of its original components to illustrate the flow of extracting minerals and turning out a commodity. Underground portions of a mine are usually unstable and should never be entered. Therefore, their integrity does not have to be considered (Noble and Spude 1992:20).

Design can apply to districts as well as individual resources. In this case, the concept covers the way buildings, sites, or structures are related (National Park Service 1990). In the case of a historic mining district, integrity of design could consider how extraction locations, mill placement, transportation routes, and other features were arranged with respect to one another and/or within a landscape. For historic rural landscapes, integrity of design refers to the composition of natural and cultural elements that comprise the form, plan, and spatial organization of a property. It reflects deliberate choices and inadvertent outcomes of land use practices, building placement, and other characteristics over time (McClelland et al. 1999:22).

SETTING

Setting is the physical environment of a historic property. Unlike location, integrity of setting refers to the character of the place in which the property achieved historical significance. This aspect of integrity deals with how the property is situated and its relationship to surrounding features and open space. Physical features that make up the setting of a historic property can be natural or manmade and should be examined not just with the boundaries of the property but also between the property and its surroundings (National Park Service 1990; McClelland et al. 1999). For historic mine sites, the features that make up the setting may include numerous manmade features such as mine and mill tailings, ruins, abandoned machinery, and other debris. Noble and Spude (1992:21) indicated that these kinds of industrial remains can represent important aspects of setting that contribute to the integrity of a mining site. In contrast, modern intrusions detract integrity of setting. These can include more recent mining activities that have destroyed historic resources or left them isolated from their surroundings. Modern development unrelated to mining can also disturb integrity of setting.

With reference to historic landscapes, setting refers to the physical environment within and surrounding a property. Large features, such as bodies of water, mountains, and others strongly influence integrity of setting, as do smaller elements such as fences, milestones, and equipment (McClelland et al. 1999:22). Aspects of setting at a historic mining property in the context of historic landscapes would include natural features such as ridges that were mined for ore or other landforms that contributed to the establishment and operation of mining activities. Small areas of equipment, such as crane mounts, trestles, tipples, and retaining walls would be examples of small-scale elements that contribute to the integrity of setting (Figure 89).

MATERIALS

Materials are the physical elements that were combined or deposited during a specific time period and in a particular pattern or configuration to form a historic property (National Park Service 1990:45). While integrity of materials typically requires the retention of original structural fabric, mines and quarry sites often experienced modifications and repair, and replacement of original components was an expected part of their working life. For these kinds of resources, retention of integrity requires the use of complementary or sympathetic materials (Noble and Spude 1992:21).

Photographic evidence indicates that most buildings and structures associated with mines and ore dressing in Georgia were almost exclusively of frame construction with wood siding (if buildings) through the early twentieth century (Figure 90). Repairs and modifications using stone, brick,

Figure 89. Small-scale elements, such as the tipple seen in the center, contribute to integrity of setting if they exist. Unidentified mine near the Georgia-Tennessee Line (Source: McCallie 1908).

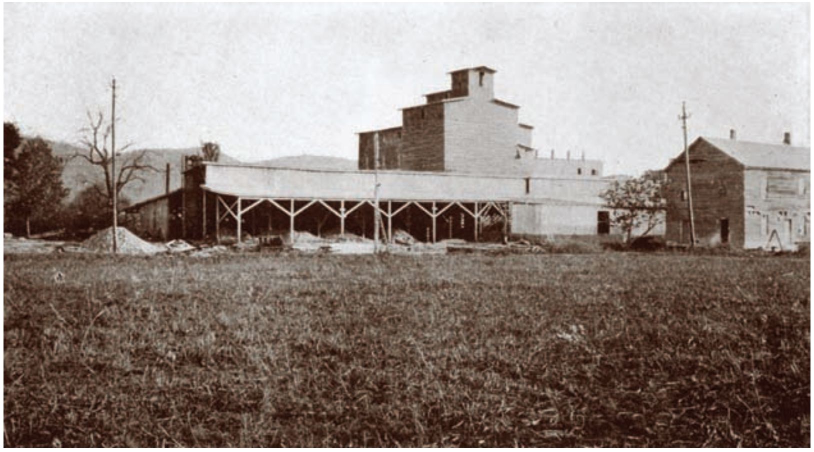


Figure 90. Most buildings and structures in Georgia mineral industries were wood. Repairs or modifications using other materials would not be compatible with original structures. The Piedmont Portland Cement Company, Polk County (Source: Maynard 1912).

cement, or corrugated metal would not be considered sympathetic to a nineteenth-century mining property, except in cases where those materials had been used originally. Thus, for instance, a head frame built of metal beams on cement footings at a site that was significant for its association with late nineteenth-century activities would be considered to lack integrity of materials.

Similarly, integrity of materials in a historic landscape considers the construction materials of structures. Additionally, the presence of native materials, such as mineral resources, can enhance a rural area's sense of place. These can be in the form of natural deposits or built construction (McClelland et al. 1999:22). For example, mine and mill tailings composed of waste rock could be construed as contributing to the integrity of materials.

WORKMANSHIP

Workmanship constitutes the physical evidence of the crafts of a particular culture or people during a given period of prehistory or history. It reflects artisans' labor and skill in constructing or altering a building, structure, object, or site. Workmanship can apply to an entire property or individual components and may be expressed as vernacular methods and techniques or as highly sophisticated work. In addition, it may reflect traditional work or innovations associated with particular periods or movements. It can indicate technologies of craft, illustrate aesthetic principals of a period, and reveal individual, local, regional, or national applications of technological processes and aesthetic principals (National Park Service 1990:45). This aspect of integrity is most often applied under Criterion C, which emphasizes design, construction, and craftsmanship.

Mines and quarries should retain evidence of original workmanship (Noble and Spude 1992:21). For example, mining structures should illustrate the skills and work used to build and maintain them. For historic landscapes, workmanship reflects the ways people have arranged their environments for functional or decorative purposes and may include the ways they construct buildings and fences or techniques and systems of land use (McClelland et al. 1999:23). Workmanship at a mining landscape would therefore include some of the same characteristics as noted above but could also refer to how mining was performed. To have integrity of workmanship, extant mining features should convey the techniques used to create them.

FEELING

Integrity of feeling considers how a resource expresses the aesthetic or historic sense of a particular time period. To have integrity of setting, a site must contain physical features and characteristics that, when considered together, convey the site's historic qualities or enhance its ability to do so (National Park Service 1990:45). Noble and Spude (1992:21) remarked that closed down and deserted mining sites are often more evocative than active ones. Abandoned mines reflect the boom and bust cycle of mining, but encroachment by modern development can affect integrity of feeling by diminishing the sense of isolation and desertion.

For historic landscapes, feeling is evoked by the presence of physical characteristics that reflect the historic scene. The sense of time and place arises from the cumulative effect of setting, design, materials, and workmanship that evoke the sense of a historic mine. Modern alterations and additions to the landscape detract from the integrity of feeling (McClelland et al. 1999:23).

ASSOCIATION

Association relates to the direct link between an important historic event or person and a historic property. A resource is considered to have integrity of association if it is the place where an event or activity took place and is sufficiently intact to convey that relationship. It requires physical features that demonstrate the associations and historic qualities (National Park Service 1990:45). Integrity of association is most important under Criteria A and B. For mine and quarry sites to have integrity of association, they must still contain structures, machinery, and other visible features and these must convey a strong sense of connectedness between properties and a contemporary observer's ability to discern the historical activity that took place at the site.

To have integrity of association as a historic landscape, a mining property must reflect the relationship between itself and the important events or persons that shaped it (McClelland et al. 1999:23). In the case of historic mines, this characteristic would entail the landscape conveying its link to a particular period of historic significance through extant structures and evidence of land use. If the mine or quarry is still in use, integrity of association might be maintained if traditional or complementary mining techniques, equipment, or systems were used, which would reinforce the historic ties between past and present.

EVALUATING SIGNIFICANT MINERAL INDUSTRIES SITES

The significance of a historic property must be assessed and explained with reference to its historic context. To assess the significance of a property within the mineral industries context, five things must be determined (National Park Service 1990):

1. The facet of history of the local area, state, or nation that the property represents;

2. Whether that facet of history is significant;

3. Whether it is a type of property that has relevance and importance in illustrating the historic context;

4. How the property illustrates that history; and

5. Whether the property possesses the physical features necessary to convey the aspect of history with which it is associated (i.e., integrity).

TThese steps are described in more detail with guidelines for evaluating historic mining properties in Georgia. The discussion follows the guidelines of the National Park Service (1990, 1991).

The first step toward evaluating historical significance is to identify what theme or area of significance, geographical area, and/or chronological period the property represents. Within the broader Criteria of Evaluation, the property must be related to one or more areas of significance or themes that refer to a

Table 2. Sample Questions/Topics for Determining Historic Themes Associated with North Georgia Mining Sites

Theme	Guiding Questions/Evaluation Topics
Archaeology	Does the resource have a potential to provide important information from archaeological study of mining processes, technology, laborers, or related domestic sites?
Commerce	Did the mine produce commodities for exchange and barter? What effect did the mine/quarry or mineral industries have on regional trade?
Community Planning and Development	Was there a company town or community associated with the mine, and if so, did it express any corporate or other ideologies or aesthetics?
Economics	How did the mine/quarry or mineral industries effect the economic development of the region or locality? Did secondary economic activities, e.g., land speculation, develop as a result of mining?
Engineering	Does the mine/quarry reflect (or not) the work of professional engineers? How does the mine exemplify mine/quarry engineering practices of the time it was in operation? What engineering innovations are present, if any?
Exploration/Settlement	Does the site reflect historical events, processes, or people related to the exploration or settlement of a locality or region?
Ethnic Heritage	Does the site relate to or reflect aspects of ethnic or national identity in mining/quarrying trades? Does the mine illustrate ethnic, cultural, or national mining/quarrying practices?
Industry	Mining and quarrying properties reflect the processes of managing materials, labor, and equipment to produce goods and services. They also produced materials used in other industries (Noble and Spude 1992:16). How does the site reflect industrial processes and approaches to producing mineral commodities? Did the site affect or influence the industrial development of a locality region? Was the site associated with broader industrial activities, such as producing a raw material used to make of other important products?
Invention	Was the site associated with the development or creation of new technologies, processes, or products? Does the site exemplify the application of new technologies, processes, or products?
Labor	Mining sites were significant in the history of unions, worker safety, and other aspects of labor history (Noble and Spude 1992:16). Does the site have associations with significant events or developments in labor history?
Landscape	Do the site and associated area illustrate aspects of distinctive land use practices associated with mining? Does the landscape exemplify or evoke images of time, place, and historical patterns related to mineral industries?
Science	Does the site have an association with important developments in geology, metallurgy, and other aspects of mining engineering (Noble and Spude 1992:17)?
Social History	Does the site have associations with significant social, labor, or corporate movements or events?

property's contributions to the broader patterns of American history (National Park Service 1991:39). Of the applicable areas of significance that Noble and Spude (1992:15-17) suggest for mining sites associated with Criterion A, the ones most relevant to north Georgia include commerce, community planning and development, economics, engineering, ethnic heritage, exploration/settlement, invention, industry, labor, law, politics/government, science, and social history. Under Criterion B, Georgia mine and quarry sites might relate to individuals who were significant in the areas of exploration/settlement, invention, and labor. Resources significant under Criterion C would most likely reflect aspects of architecture and engineering. Sites eligible under Criterion D must contain information useful for research into history and prehistory, and so are most likely to have significance in the area of archaeology. To be considered significant under this criterion, sites should be evaluated with respect to research questions that identify the research questions and data sets necessary to address them (Noble and Spude 1992:17).

Assessing eligibility also requires determining a property's period of significance, which refers to the length of time it was associated with important events, activities, or persons, or attained the characteristics that qualify it for the NRHP (National Park Service 1991:42). Determining a period of significance depends on the Criterion of Evaluation the site is relevant to:

- Under Criterion A (associations with important events) the period of significance is the time when the event took place. If the site is significant because of its association with historic trends, the period of significance would be the time span when the property actively contributed to the trend.

- For Criterion B (association with historically important persons) the period of significance would be the time when the property was associated with the important person. For mining sites, it would be important to consider the time period when the historic person was actively involved in mining.

- Sites eligible under Criterion C (engineering, technology, or design qualities) would have a period of significance corresponding to the dates of construction and any significant alterations or additions.

- For sites eligible under Criterion D (research potential), the period of significance is the time or estimated time when it was occupied or used for reasons related to its importance (National Park Service 1991:42).

Finally, the site's geographical area has to be specified. It is possible that research of individual sites could lead to relatively specific geographical areas of particular mineral industries in the state. For this document, however, the geographical area can be broadly described as north Georgia or Georgia above the Fall Line, which comprises a geologically distinct area that gave rise to diverse mineral industries.

The next step to evaluating a historic mineral resources property is to determine if it is important in illustrating the historic context. As discussed in a previous section, the property types that represent the historic minerals of north Georgia context reflect the range of activities associated with extracting minerals and turning them into commodities. A wide range of property types can be associated with this context.

The fourth step in the evaluation process is to determine how the property represents the context through specific historic associations, architectural or engineering values, or information potential. In this case, the property types described previously reflect the mining context. Site-specific archival research and fieldwork would be required to determine how individual properties relate to and reflect the four criteria and areas of significance.

The final step in evaluating properties is to determine if they possess the physical features necessary to reflect the significance of the historic context. This involves considering the ways that the properties can represent the theme. Noble and Spude (1992:25) suggested that addressing the following questions would clarify and explain the significance of a property:

- How do the extant portions of mining processes or functions relate to broader mining or technological development of the locality, region, state, or nation?

- How important were the entrepreneurs, engineers, laborers, ethnic groups, and others who contributed to the development of the mining operation?

- How do the remaining buildings, structures, sites, objects, and historic districts reflect significant mining production processes?

- How did the mining operations impact or influence other activities, such as settlement or commerce, in a given area or region?

- How is the evidence of historic mining activity reflected in the archaeological record?

At this stage, the property must also be evaluated with respect to the applicable aspects of integrity. Properties that have the defined characteristics are eligible for the NRHP.

VIII. Summary: Recording and Evaluating Historic Mining Sites in North Georgia

Georgia has a rich history of mineral industries and physical reminders of this heritage can be found throughout the northern part of the state. While the remnants of mines and quarries, along with the subsidiary features needed to operate them, persist, they are in varying conditions and states of completeness. These cultural resources are not always easy to identify and connect to historic mining activities. Once identified, moreover, they raise difficult questions regarding what makes them significant and worth further preservation or study. This context is intended to provide guidance for identifying these kinds of cultural resources and evaluating their historical significance.

Identifying and recording mining properties is a key objective. The large, sprawling, and sometimes discontinuous nature of these properties makes them challenging to find and record in ways that illustrate their overall plans and operation. In order to evaluate the significance of a mining site, it must be viewed and understood in its entirety. Sometimes this will require approaching it as a cultural landscape. With this approach, unconnected and sometimes seemly isolated features, structures, and sites can be seen as parts of a wider geographic area that has been used historically for a specific purpose (mineral extraction and processing).

To better identify these kinds of properties, it is suggested that greater use be made of archival sources prior to field survey. Historic maps, aerial photographs, and other documents can indicate whether mining was a significant activity in a survey locale and what kinds of mining took place. Surveys can also make use of different techniques. For archaeologists, this would involve less shovel testing and more intensive surface survey. Historians would also need to look more broadly at the areas surrounding individual properties to find the shafts, cuts, tailings, and other structures related to it.

These approaches to identifying sites lead directly to the specific requirements of recording them. Recording these sites is particularly important in assessing historic significance. Whereas survey work may be sufficient to identify the general parameters of a site and its content, recording involves more intensive fieldwork, again relying on pedestrian survey for both archaeologists and historians, to provide a more detailed understanding of a property's content and condition. Additional historical research might also be necessary to understand the life cycle of individual mining properties and what activities took place there. Finally, where historic maps are available, the use of georeferencing is encouraged to project the locations of features, structures, and activity areas and compare these to the current situation.

The process for identifying and evaluating historic mining properties also requires linking them to one or more historic contexts. A historic context describes patterns or trends in history that can be used to understand particular events, properties, or sites and link individual occurrences to broader historical patterns. This document provided histories of mineral industries in north Georgia as a framework for identifying, interpreting, and understanding individual properties. The state had a series of active and important mineral industries. Notably, the first gold rush in the United States took place in north Georgia. Late in the nineteenth century, the state became a leading producer of certain materials, such as marble and kaolin. Other minerals were not as prominent nationally, but Georgia's production of them points to a varied and dynamic non-agricultural economy in the state during the 1880s to around 1920, the most vigorous period of north Georgia mining. Individual minerals have their own histories, however, and while most were developed commercially during this period, others had separate periods of significance. Gold, for example, was mined most intensely between the 1820s and 1840s, with some resurgence during the late nineteenth and early twentieth centuries. Kaolin, on the other hand, became important only at the end of the nineteenth century and remains an important product in some areas of the state to the present.

Historic contexts also have geographical components, and north Georgia's complex geology was one factor that contributed to the variety of mining industries here. The fall line divides Georgia into distinctive zones, with the Coastal Plain to the south having little of the geological diversity of the north and containing much less diverse mineral industries. North Georgia therefore represents a discrete geographical area with distinct characteristics that gave rise to assorted mining and quarrying activities.

Another important factor in dealing with historic mining resources at the survey and recording stage, as well as during evaluation, is to accurately identify overall sites and individual components. This document provides overviews of mining and quarrying procedures to illustrate how separate processes and equipment worked together in extracting, processing, and shipping materials in north Georgia. Additionally, the guide to property types describes the kinds of structures, features, and sites produced by each process and which historians and archaeologists might find at former mines. These sections should encourage surveyors to look closely at sites and move beyond simply identifying various cuts, pits, and piles to placing them in their proper relation to one another as part of functioning systems.

Finally, this document provides a discussion and specific steps for evaluating historic mining resources in north Georgia for the NRHP. The principal steps for accomplishing evaluations are to identify the aspect of history a property represents, determine if that aspect is significant, ascertain if the property is relevant to illustrating the historic context, explain how the property illustrates the history, and assess whether the property possesses enough integrity to convey the aspect of history it reflects. An ideal site for the NRHP would have clear representations of the processes of extracting minerals and processing them, along with evidence of auxiliary activities such as transportation, water supply, power supply, and possibly administration and residential areas. Additionally, it should be possible to relate these resources to specific historic contexts or themes. Sites that only retain one aspect of the mining process, or have been reworked so often that individual features cannot be related to one another or to a historic period, have poor integrity. However, each site has to be considered on its own, and even a property missing some elements can still be have integrity as a system if its overall function can be discerned.

If mining properties are viewed as historic landscapes or elements of historic landscapes, then similar guidelines apply. To have integrity, a historic landscape must convey its relationship to historic practices and traditional activities. A property could still have integrity while missing some historic elements or containing some modern introductions, but the landscape should strongly indicate the patterns of land use, activities, and modifications to the land that connect it to a historic context.

In summary, north Georgia's mineral industries have produced a rich record of structures, features, and sites. These properties are an important component of Georgia's heritage but care must be taken to identify and record them fully and accurately. In evaluating their significance, they should be viewed with respect to the context of historic mining as well as the mining procedures they represent. In addition, it is important to consider if they contain enough integrity to convey their associations to aspects of history. In north Georgia, ongoing and post-mining activities can substantially impact the condition of historic mining properties, making their NRHP eligibility a complicated task. Within mining properties relatively common in some parts of north Georgia, eligibility should be applied to sites that have exemplary remains and clear historical associations.

This context should benefit the recording and documentation of mining sites, which in turn may address future research. Topics for future consideration include:

1. Are different mineral prospecting property types associated with different minerals in the region?
2. Do the types/features of prospecting change over time?
3. How do extraction property types vary by mineral resource? Do they vary by time?
4. What technologies were used in north Georgia mining and quarrying? How were new technologies adopted and modified for use in Georgia?
5. What is the distance relationship between mining property locations and Georgia's railroad? Can the origin of mining sites be correlated with the arrival of the railroad in different areas of the region?
6. Did mining companies pursue multiple mineral resources in one region, move from one area to another in search of the same mineral resources, or both? What factors influenced company's organization and operations?
7. Where did north Georgia mining operations draw labor? Was it from local populations or made up of immigrants? How was housing arranged? How did social ideologies influence the way mining communities were set up and managed? Were there variations among different types of minerals or regions?

Use of the maps and tables presented in Appendices 2 and 3 in combination with the description of mineral processes and property types provided previously should begin to compile the data needed to address these and other questions and to better understand the history of mining in north Georgia.

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Appendix 1. Mineral Resources of the Blue Ridge and Piedmont

TABLE 1: MINERAL RESOURCES OF THE BLUE RIDGE AND PIEDMONT

County	Mapped Mineral Resources	Prospects/Mines	GNIS Mines	Geologic Description/ Formation
BALDWIN	Clay, Granitic Rock Types	Feldspar, Sand		
BANKS	Clay, Granitic Rock Types	Beryl, Granite, Kyanite, Sand, Sulphide Deposits		
BARROW	Clay, Granitic Rock Types	Asbestos, Beryl, Granite		
BARTOW	Gold, Granitic Rock Types, Iron/ Manganese, Limestone, Dolostone, Clay, Marble, Shale,Clay	Asbestos, Beryl, Granite	Bartow County Quarry	Granite Gneiss/Gneisic Granite (Augen or Porphyritic)
			Glade Mine	Biotite Gneiss/Mica Schist
BIBB		Feldspar, Granite		
BUTTS	Granitic Rock Outcrops, Granitic Rock Types	Sillimanite		
CARROLL	Clay, Gold, Granitic Rock Outcrops, Granitic Rock Types, Sulfide Deposits	Corundum, Gold, Granite, Kyanite, Mica, Sand, Sulphide Deposits	Bonner Mine	Granitic Gneiss Undifferentiated
			Chambers Mine	
			Clopton Mine	
			Hart Mine	
			Jones Mine	
			Southern Klondyke Mine	
			Villa Rica Quarry	Granite Undifferentiated
CHEROKEE	Gold, Granitic Rock Types, Iron, Kyanite, Marble, Mica, Quartzite, Shale,Clay	Asbestos, Barite, Beryl, Corundum, Gold, Granite, Iron, Kyanite, Mica, Soapstone, Sulphide Deposits	Sixes Mine	Amphibolitic Schist
			Cherokee Quarry	Biotite Gneiss
			Macou Prospect	Graphite Schist
			Three Hundred and One Mine	
			Bell-Star Mine	Mica Schist
			Putnam Mine	
			Franklin Gold Mine	Mica Schist/Amphibolite
			Standard and Swift Mines	
			Cherokee Mine	Mica Schist/Gneiss
			Clarkston Mine	
			Downing Creek Placer Mine	
CLARKE	Granitic Rock Types	Granite, Sand, Sillimanite		
CLAYTON	Granitic Rock Types	Beryl, Granite	Forest Park Quarry	Granite Gneiss/ Amphibolite

County	Mapped Mineral Resources	Prospects/Mines	GNIS Mines	Geologic Description/ Formation
COBB	Clay, Gold, Granitic Rock Types, Quartzite	Asbestos, Corundum, Gold, Iron, Kyanite, Mica, Sulphide Deposits	Kennesaw Quarry	Mica Schist
COLUMBIA		Chromite, Corundum, Feldspar, Granite, Quartzite		
COWETA	Clay, Granitic Rock Outcrops, Granitic Rock Types	Asbestos, Feldspar, Gold, Granite	Madras Quarry	Porphyritic Granite
CRAWFORD	Granitic Rock Types	Feldspar		
DAWSON	Gold, Granitic Rock Outcrops, Granitic Rock Types, Kyanite	Gold, Iron, Kyanite, Mica, Sulphide Deposits		
DEKALB	Clay, Granitic Rock Outcrops, Granitic Rock Types, Quartzite	Beryl, Granite	Lithonia Quarry	Granitic Gneiss Undifferentiated
DOUGLAS	Clay, Gold, Granitic Rock Outcrops, Granitic Rock Types, Quartzite	Corundum, Gold, Granite, Sulphide Deposits	Lithia Springs Quarry	Granite Gneiss/Gneisic Granite (Augen or Porphyritic)
			Roach Prospect	
			Pine Mountain Mine	Granitic Gneiss Undifferentiated
			Twohundred and Twelve Prospect	
			Villa Rica Mine	
ELBERT	Clay, Gold, Granitic Rock Outcrops, Granitic Rock Types, Mica, Sillimanite	Beryl, Feldspar, Gold, Granite, Mica, Sillimanite		
FANNIN	Iron, Kyanite, Marble, Sulfide Deposits	Flagstone, Gold, Granite, Iron, Iron/ Manganese, Kyanite, Manganese, Mica, Slate, Sulphide Deposits, Talc	Bryant Prospect	Metagraywacke/ Mica Schist-Quartzite/ Amphibolite
			Jeptha Patterson Prospect	
			Kellogg Prospect	
			Mine Number 20	
			Mobile Mine	
			Mount Pisgah Prospect	
			Payne Prospect	
			Sally Jane Prospect	
			Tanner Prospect	
FAYETTE	Granitic Rock Types	Granite		
FORSYTH	Gold, Granitic Rock Types, Quartzite	Beryl, Corundum, Gold		
FRANKLIN	Granitic Rock Types, Mica			
FULTON	Clay, Gold, Granitic Rock Types, Quartzite	Granite		

County	Mapped Mineral Resources	Prospects/Mines	GNIS Mines	Geologic Description/ Formation
GILMER	Gold, Iron, Marble	Gold, Granite, Iron, Manganese, Mica, Tripoli	Ellijay Quarry	Mica Schist
GORDON	Limestone, Dolostone, Clay, Marble	Flagstone, Iron		
GREENE	Clay, Granitic Rock Types	Granite, Sand	Siloam Quarry	Porphyritic Granite
GWINNETT	Clay, Gold, Granitic Rock Outcrops, Granitic Rock Types, Quartzite	Granite, Sand, Sulphide Deposits	Grayson Quarry	Granitic Gneiss Undifferentiated
			Norcross Quarry	Granite Gneiss/ Amphibolite
HABERSHAM	Asbestos, Corundum, Soapstone, Talc, Vermiculite, Clay, Feldspar, Mica, Gold, Granitic Rock Outcrops, Granitic Rock Types, Kyanite, Marble, Quartzite	Asbestos, Corundum, Feldspar, Flagstone, Gold, Iron, Kyanite, Mica, Soapstone, Sulphide Deposits, Talc		
HALL		Corundum, Feldspar, Flagstone, Gold, Granite, Mica, Sulphide Deposits		
HANCOCK	Clay, Gold, Granitic Rock Types, Marble, Quartzite	Granite, Sand		
HARALSON	Gold, Granitic Rock Types, Marble	Gold, Iron, Iron/Manganese, Mica, Sulphide Deposits	Royal-Vindicator Mine	Graphite Schist
HARRIS	Granitic Rock Outcrops, Granitic Rock Types, Quartzite	Mica		
HART	Granitic Rock Types, Mica, Sillimanite	Feldspar, Gold, Iron, Mica, Sillimanite	Taylor Mine	Sillimanite Schist/ Gneiss/Amphibolite
HEARD	Clay, Granitic Rock Outcrops, Granitic Rock Types	Corundum, Granite, Mica	Heard County Quarry	Biotite Gneiss
HENRY	Granitic Rock Outcrops, Granitic Rock Types	Gold, Granite, Mica	Mathers Quarry	Biotite Gneiss/ Feldspathic Biotite Gneiss
			Stockbridge Quarry	
JACKSON	Clay, Granitic Rock Types	Asbestos, Beryl, Granite		
JASPER	Granitic Rock Types	Beryl, Feldspar, Granite, Mica, Sillimanite		
JONES	Granitic Rock Types	Feldspar, Granite		
LAMAR	Granitic Rock Types, Mica, Quartzite	Beryl, Granite, Mica, Sillimanite		
LINCOLN	Clay, Gold, Granitic Rock Types	Gold, Kyanite, Manganese, Mica, Sulphide Deposits	Magruda Mines	Felsic Metavolcanics

County	Mapped Mineral Resources	Prospects/Mines	GNIS Mines	Geologic Description/ Formation
LUMPKIN	Gold, Granitic Rock Outcrops, Granitic Rock Types, Mica	Asbestos, Corundum, Gold, Granite, Iron, Iron/Manganese, Kyanite, Mica, Sillimanite, Soapstone, Sulphide Deposits	Bainbridge Shaft	Amphibolitic Schist/ Amphibolite-Metagraywacke/Mica Schist
			Barlow Cuts	
			Barlow Mine	
			Bowmen Cut	
			Capps Prospect	
			Columbia Cut	
			Crown Mountain Cuts	
			Fishtrap Cuts	
			Gordon Cut	
			Hedwig-Chicago Mine	
			Ivy Cut	
			Josephine-Topabri Mine	
			North Barlow Cut	
			Preacher Cut	
			Ralston Mine	
			Whim Hill Mine	
			Cavender Creek Mine	Granitic Gneiss Undifferentiated
			Dahlonega Quarry	
			Jumbo Mine	
			Battle Branch Mine	Mica Schist
			Blackwell Shaft	
			Boston Cut	
			Etowah Mine	
			Gayden Shaft	
			Gold Hill Mine	
			Pollard Tunnel	
			Rogers Shaft	
			Bast Cut	Mica Schist/Amphibolite
			Benning Lot Mine	
			Calhoun Gold Mine	
			Chestatee Mine	
			Consolidated Mine	
			Dead Horse Shaft	
			Findley Mine	
			Hand Cut	
			Singleton Cut	
			Tahloneka Mine	
			Turkey Hill Mine	
			Yahoola Cuts	
			Betz Mine	Mica Schist/Gneiss
			Garnet Mine	Quartzite/Mica Schist

County	Mapped Mineral Resources	Prospects/Mines	GNIS Mines	Geologic Description/ Formation
MADISON	Gold, Granitic Rock Types, Sillimanite	Feldspar, Granite, Graphite, Sillimanite		
MCDUFFIE	Clay, Gold, Granitic Rock Types	Gold, Granite		
MERIWETHER	Gold, Granitic Rock Outcrops, Granitic Rock Types, Quartzite			
MONROE	Granitic Rock Types, Mica	Asbestos, Bauxite, Granite, Mica	Macon Quarry	Biotite Gneiss
MORGAN	Dolostone, Chert, Marble, Limestone, Dolostone, Clay, Marble, Talc	Corundum, Gold, Sillimanite		
MURRAY		Gold, Iron, Manganese	Georgia Mine	Biotite Gneiss/ Feldspathic Biotite Gneiss
			Old Cohutta Mine	
			Southern Mine	Slate/Quartzite/ Conglomerate
			Bramlet Mine	Ultramafic Rocks Undifferentiated
			Cohutta Mine	
			Fort Mountain Mine	
			Pickering Mine	
MUSCOGEE	Granitic Rock Outcrops, Granitic Rock Types	Granite	Barin Quarry	Hornblende Gneiss/ Amphibolite/Granite Gneiss
NEWTON	Granitic Rock Outcrops, Granitic Rock Types	Feldspar, Gold, Granite, Sand, Sillimanite		
OCONEE		Granite, Mica, Sillimanite		
OGLETHORPE	Clay, Gold, Granitic Rock Outcrops, Granitic Rock Types, Sillimanite	Gold, Granite, Sillimanite, Sulphide Deposits	Guarentee Mine	Undifferentiated Metavolcanics/ Sericite phyllite/ Meta-argillite/ Quartz mica schist
			Morgan Mine	
PAULDING	Gold, Granitic Rock Types, Sulfide Deposits	Asbestos, Corundum, Feldspar, Gold, Granite, Iron, Iron/Manganese, Manganese, Mica, Sulphide Deposits	Hicks Prospect	Amphibolitic Schist/ Amphibolite
			Yorkville Mine	
			Dunaway Mine	Biotite Gneiss
			Paulding Quarry	Granitic Gneiss Undifferentiated
			Hodges Prospect	Hornblende Gneiss/ Amphibolite
			Merritt Mine	
			Russell Mine	
			Sheffield-Heidt Prospect	
			Twilley Mine	
			Baxter Prospect	Sericite Schist

County	Mapped Mineral Resources	Prospects/Mines	GNIS Mines	Geologic Description/ Formation
PICKENS	Granitic Rock Outcrops, Granitic Rock Types, Kyanite, Marble, Mica, Sericite	Beryl, Feldspar, Flagstone, Granite, Iron, Kyanite, Mica, Sand		
PIKE	Granitic Rock Types, Quartzite	Granite, Mica, Quartzite, Sand		
POLK	Limestone, Dolostone, Clay, Marble, Shale,Clay			
PUTNAM	Clay, Granitic Rock Types	Feldspar		
RABUN	Asbestos, Corundum, Soapstone, Talc, Vermiculite, Feldspar, Mica, Gold, Kyanite, Quartzite	Asbestos, Beryl, Corundum, Feldspar, Gold, Granite, Mica, Olivine, Soapstone, Sulphide Deposits, Talc, Vermiculite	Chattooga River Prospect	Aluminous Schist
			Hedden Placer Mine	
			Rabun Gap Quarry	Granitic Gneiss Undifferentiated
			Hicks Mine	Metagraywacke/Mica Schist
			Laurel Creek Mine	
			Moore Girls Mine	
			Reid Mine	
			Borrow Pit	Quartzite
RICHMOND	Clay	Quartzite		
ROCKDALE	Granitic Rock Outcrops, Granitic Rock Types	Granite, Sand		
SPALDING	Granitic Rock Types	Beryl, Granite, Mica	Griffin Quarry	Granite Undifferentiated
STEPHENS	Clay, Granitic Rock Types, Marble	Granite, Manganese		
TALBOT	Granitic Rock Types, Quartzite	Feldspar, Granite, Kyanite, Mica, Sillimanite		
TALIAFERRO	Clay, Granitic Rock Types	Feldspar, Gold, Manganese		
TAYLOR	Gold, Granitic Rock Outcrops, Sulfide Deposits	Feldspar		
TOWNS	Gold, Granitic Rock Outcrops, Sulfide Deposits	Asbestos, Corundum, Gold, Granite, Iron, Iron/Manganese, Kyanite, Mica, Olivine, Quartzite, Sillimanite, Sulphide Deposits, Vermiculite		
TROUP	Granitic Rock Types	Asbestos, Beryl, Chromite, Feldspar, Granite, Mica, Olivine	LaGrange Quarry	Quartzite
UNION	Gold, Granitic Rock Outcrops, Kyanite, Mica	Corundum, Gold, Granite, Kyanite, Mica, Sulphide Deposits		
UPSON	Granitic Rock Types, Mica, Quartzite	Beryl, Granite, Kyanite, Mica		

County	Mapped Mineral Resources	Prospects/Mines	GNIS Mines	Geologic Description/ Formation
WALTON	Granitic Rock Outcrops, Granitic Rock Types	Corundum, Gold, Granite, Mica, Sillimanite		
WARREN	Clay, Granitic Rock Types	Gold, Granite, Mica		
WHITE	Asbestos, Corundum, Soapstone, Talc, Vermiculite, Gold, Granitic Rock Outcrops, Granitic Rock Types, Mica	Asbestos, Feldspar, Granite, Iron/ Manganese, Mica, Quartzite, Sillimanite, Soapstone, Sulphide Deposits, Talc	Childs Mine	Hornblende Gneiss/ Amphibolite
			Lot Ten Mine	
			White County Mine	
WILKES	Clay, Gold, Granitic Rock Outcrops, Granitic Rock Types	Chromite, Feldspar, Gold, Kyanite, Mica, Sulphide Deposits	Fairy Ridge Mine	Undifferentiated Metavolcanics/ Sericite phyllite/ Meta-argillite/ Quartz mica schist
			Stony Ridge Mine	Sericite Schist/ Micaceous Quartzite/ Sericite Phyllite

Notes:

1) Mapped Mineral Resources and Mines/Prospect information from State of Georgia, 1969, Mineral Resource Map. Scale 1:500,000.

2) GNIS mines data from USGS Geographic Information System http://geonames.usgs.gov/pls/gnispublic/f?p=139:1:4392046156868826. Accessed on November 9, 2010.

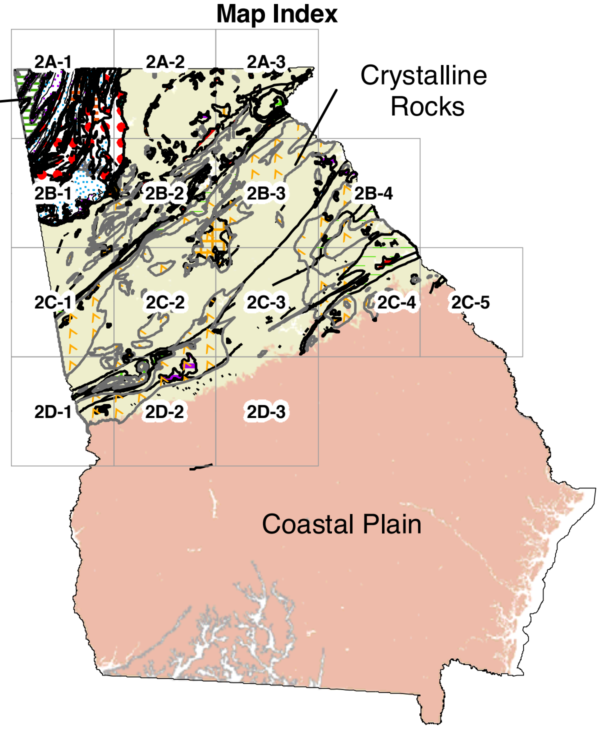
3) Geologic Description/Formation data from Open-File Report 2005-1323: Preliminary integrated geologic map databases for the United States: Alabama, Florida, Georgia, Mississippi, North Carolina, and South Carolina. http://pubs.usgs.gov/of/2005/1323/. Accessed on November 15, 2010.

Appendix 2. Mineral Resources, Mines and Prospects of North Georgia

Mapped Areas of Mineral Resources

B;O	Barite, Ocher
Bx	Bauxite
C;S;Sh	Coal, Sandstone, Shale
D,C,MI	Dolostone, Chert, Marble
Fe	Iron
Fe, Mn	Iron, Manganese
Ls,MI	Limestone, Marble
Ls,D	Limestone, Dolostone, Clay, Marble
Ss,Sh	Sandstone, Shale
Sh,Cl	Shale, Clay
A,C,S,T,V	Asbestos, Corundum, Soapstone, Talc, Vermiculite
Cl	Clay
F, M	Feldspar, Mica
Au	Gold
Gra	Granite and Related Rock Areas
Gr	Granite and Related Rock Outcrops
Ky	Kyanite
MI	Marble
M	Mica
Qtz	Quartzite
Se	Sericite
Si	Sillimanite
Su	Sulfide Deposits
T	Talc

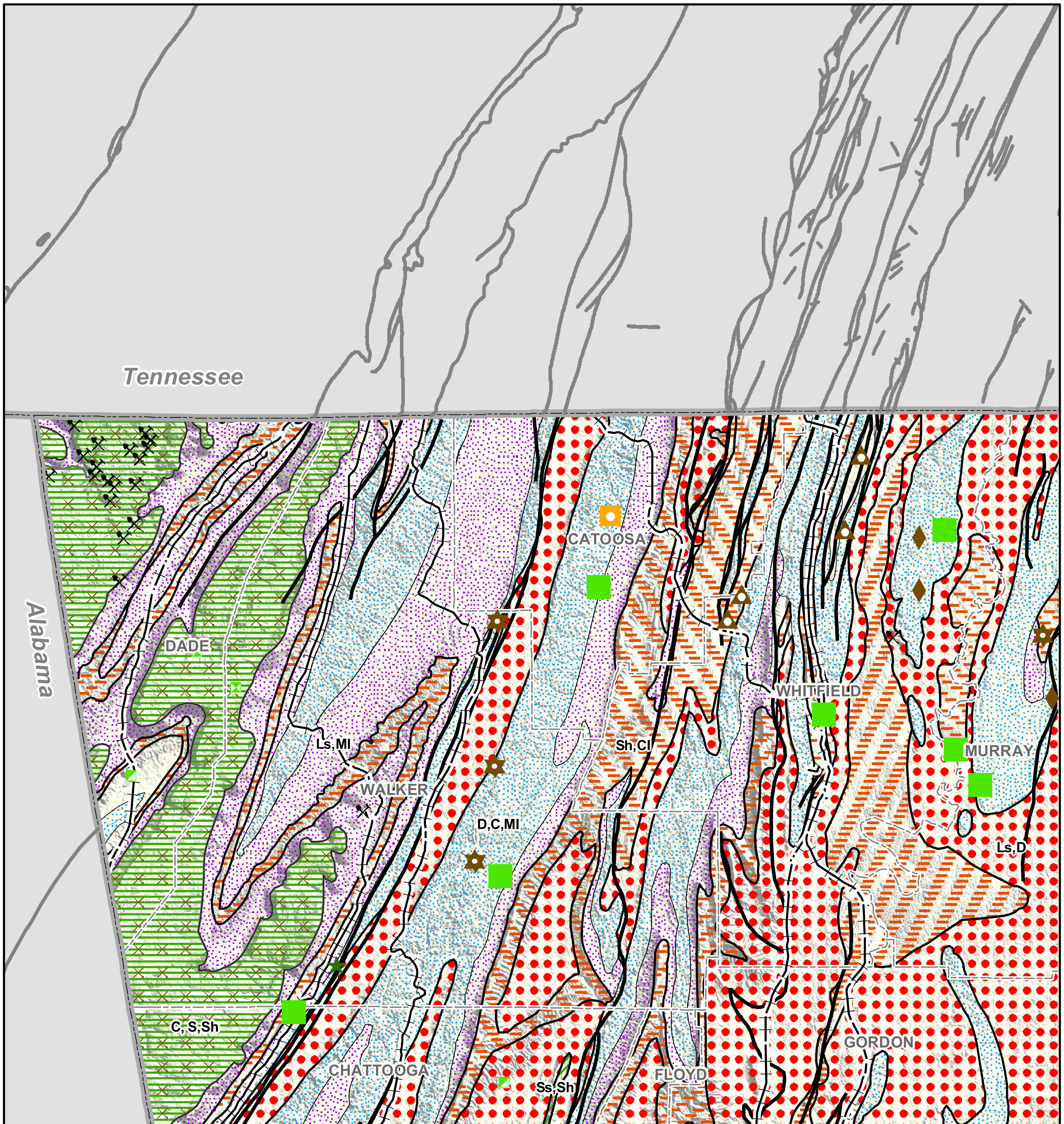
Map Index



Locations of Mines and Prospects

Barite	Feldspar
Bauxite	Corundum
Flagstone	Gold
Halloysite	Granite
Iron	Graphite
Iron, Manganese	Kyanite
Manganese	Mica
Pyrite/Sulphide Deposits	Olivine
Sand	Quartzite
Slate	Sillimanite
Tripoli	Soapstone
Asbestos	Talc
Beryl	Vermiculite
Chromite	Gravel

Reference: From Mineral Resources Map, 1969, State of Georgia Scale 1;500,000. Atlanta: The Department of Natural Resources.



Appendix 2A-1

Mineral Resources, Mines and Prospects of North Georgia

1:500,000

0 5 10 20

Miles

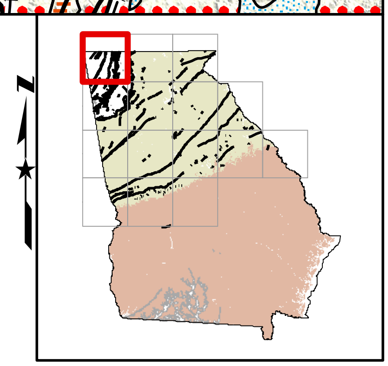
Geologic Fault Line

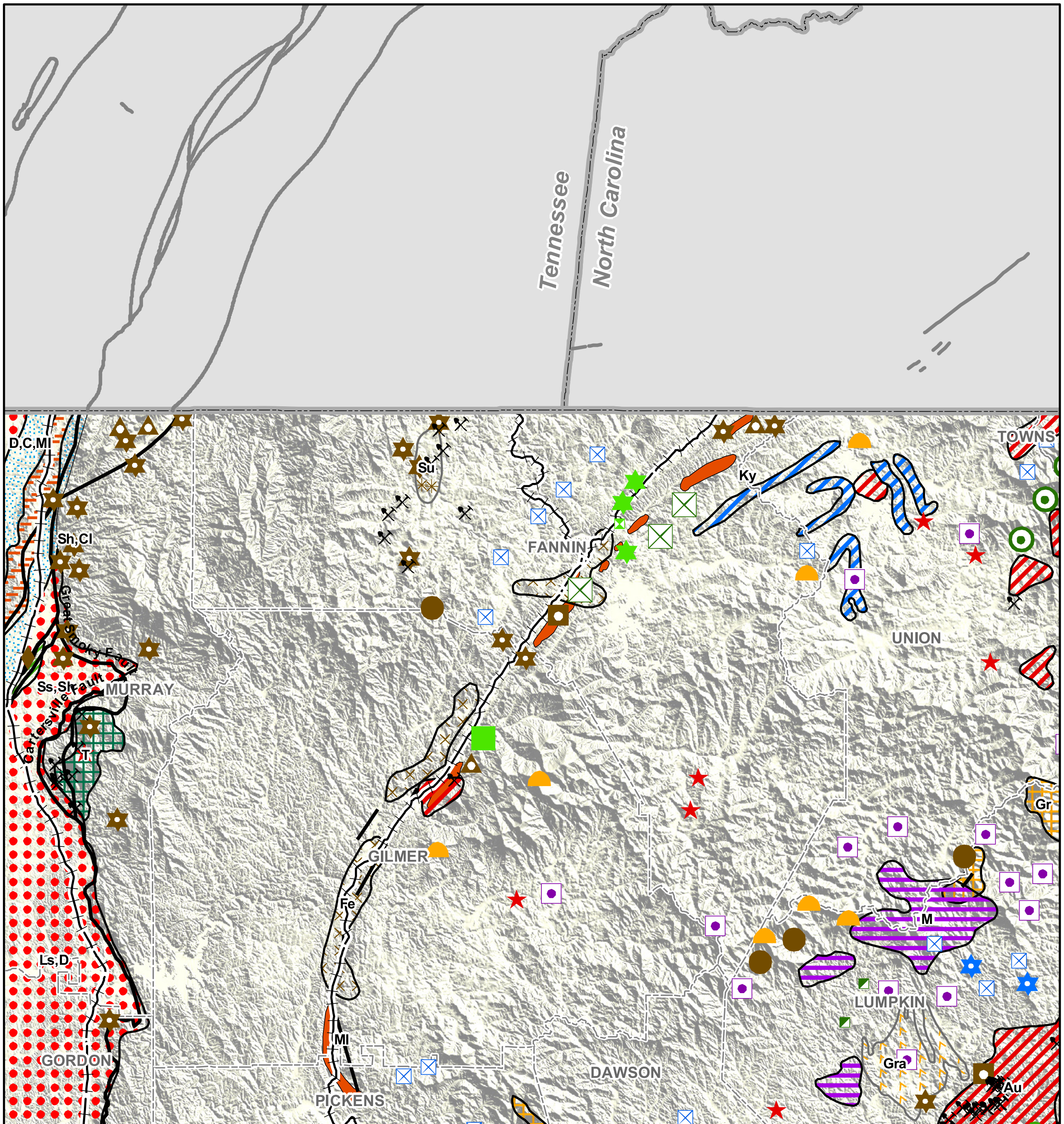
Railroad

GNIS Mine

Note: Resource areas and symbols shown on Appendix 2.

Reference: From Mineral Resource Map, 1969, State of Georgia





Appendix 2A-2

Mineral Resources, Mines and Prospects of North Georgia

Geologic Fault Line
Railroad
GNIS Mine

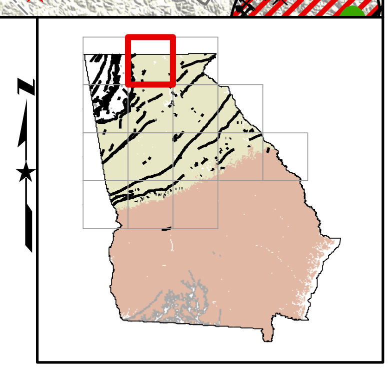
1:500,000

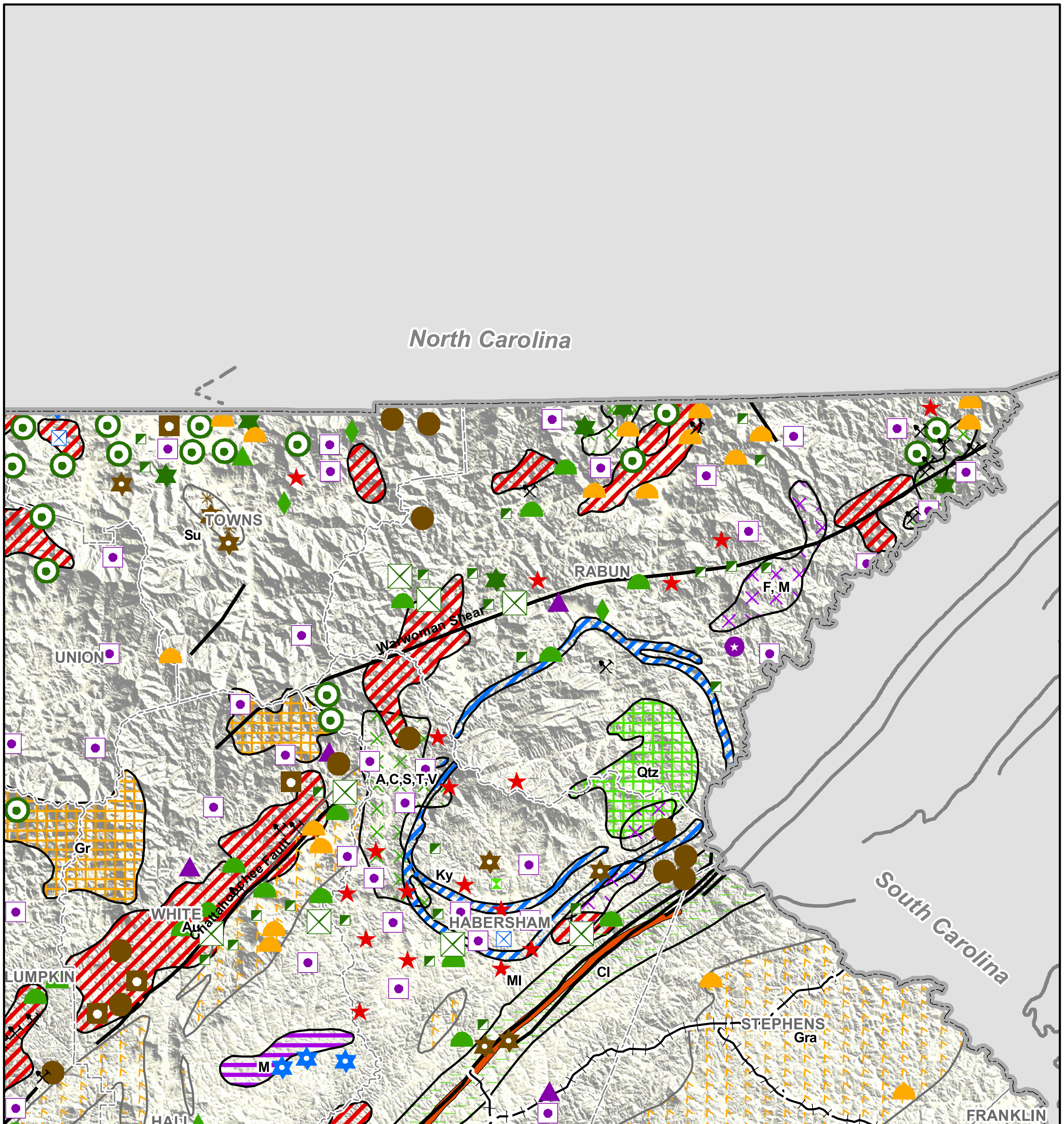
0 5 10 20

Miles

Note: Resource areas and symbols shown on Appendix 2.

Reference: From Mineral Resource Map, 1969, State of Georgia





Appendix 2A-3

Mineral Resources, Mines and Prospects of North Georgia

Geologic Fault Line

Railroad

GNIS Mine

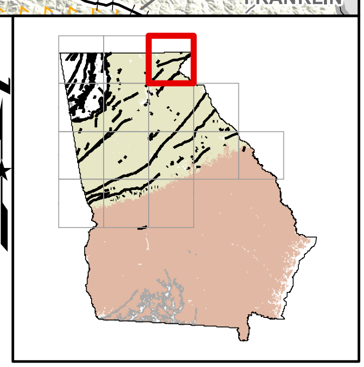
1:500,000

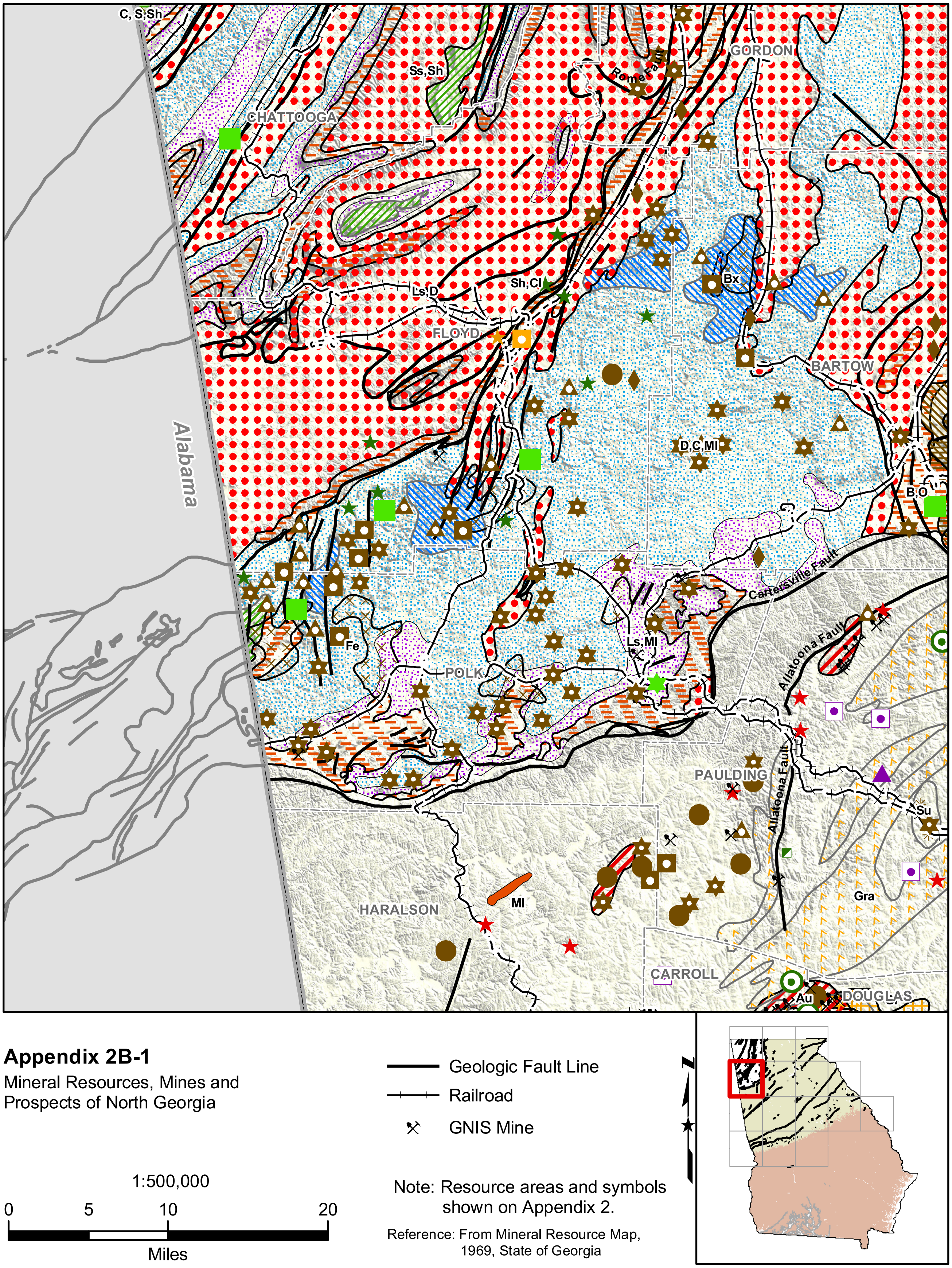
0 5 10 20

Miles

Note: Resource areas and symbols shown on Appendix 2.

Reference: From Mineral Resource Map, 1969, State of Georgia





Appendix 2B-1

Mineral Resources, Mines and Prospects of North Georgia

1:500,000

0 5 10 20

Miles

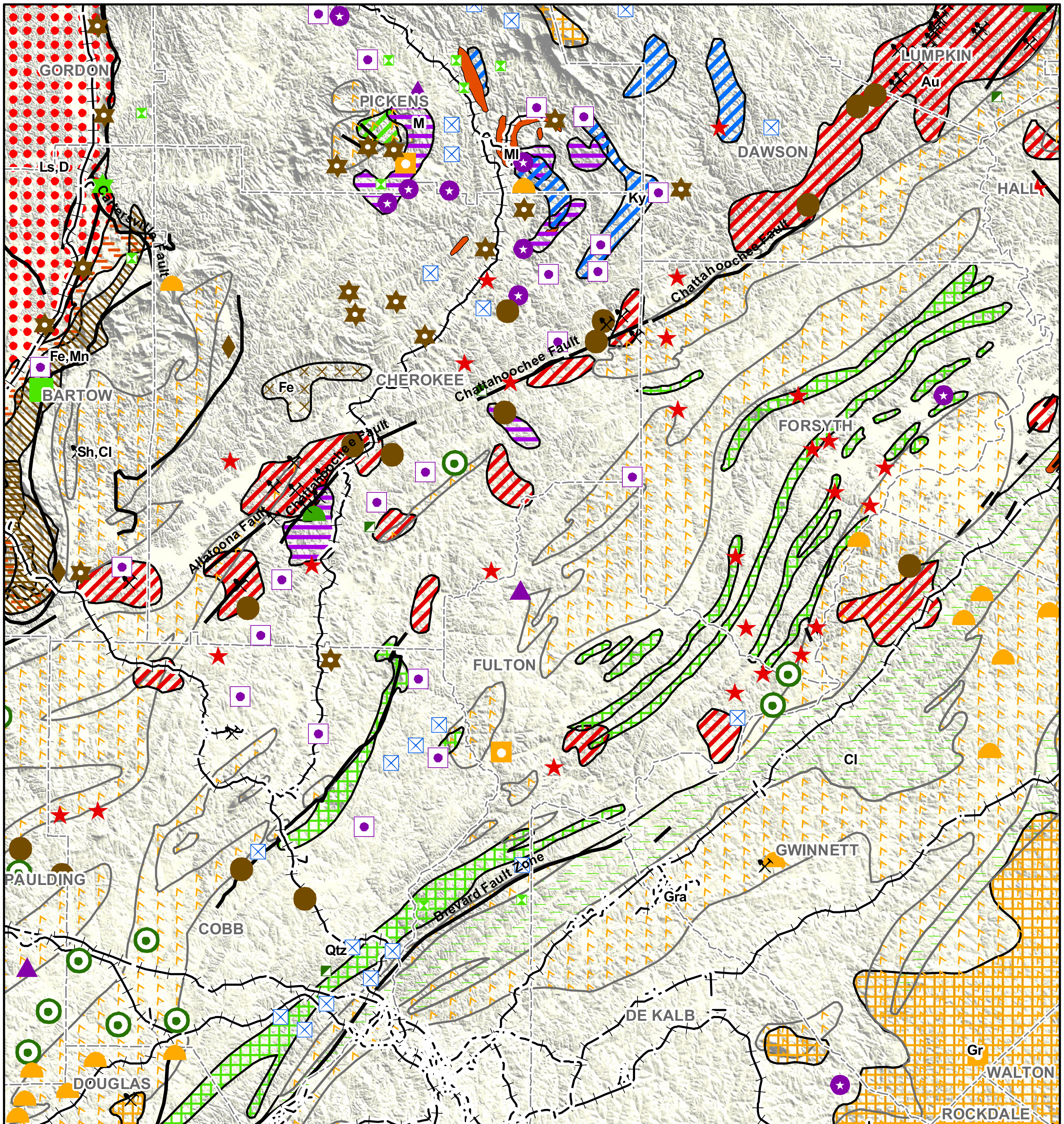
Geologic Fault Line

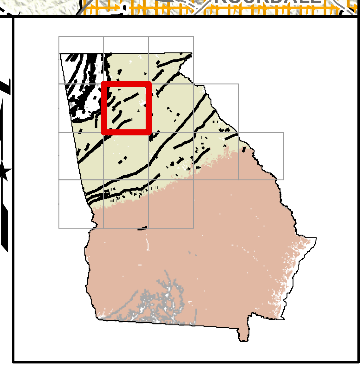
Railroad

GNIS Mine

Note: Resource areas and symbols shown on Appendix 2.

Reference: From Mineral Resource Map, 1969, State of Georgia





Appendix 2B-2

Mineral Resources, Mines and Prospects of North Georgia

Geologic Fault Line

Railroad

GNIS Mine

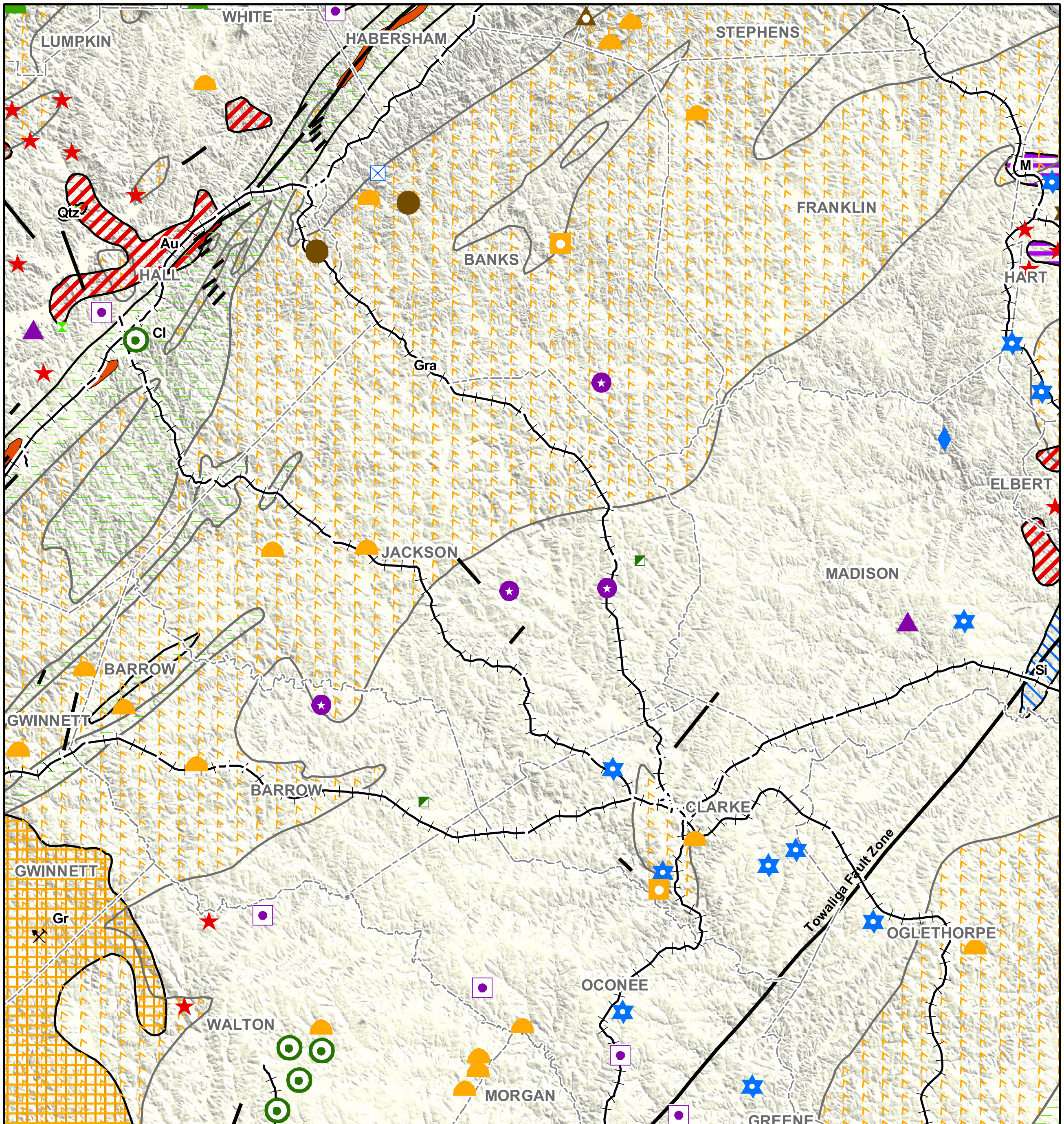
1:500,000

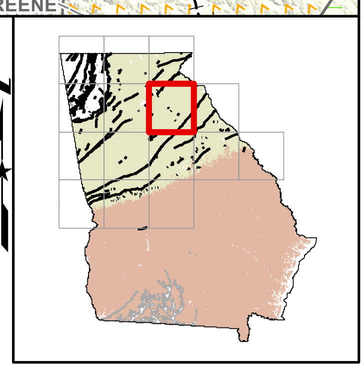
0 5 10 20

Miles

Note: Resource areas and symbols shown on Appendix 2.

Reference: From Mineral Resource Map, 1969, State of Georgia





Appendix 2B-3

Mineral Resources, Mines and Prospects of North Georgia

Geologic Fault Line

Railroad

GNIS Mine

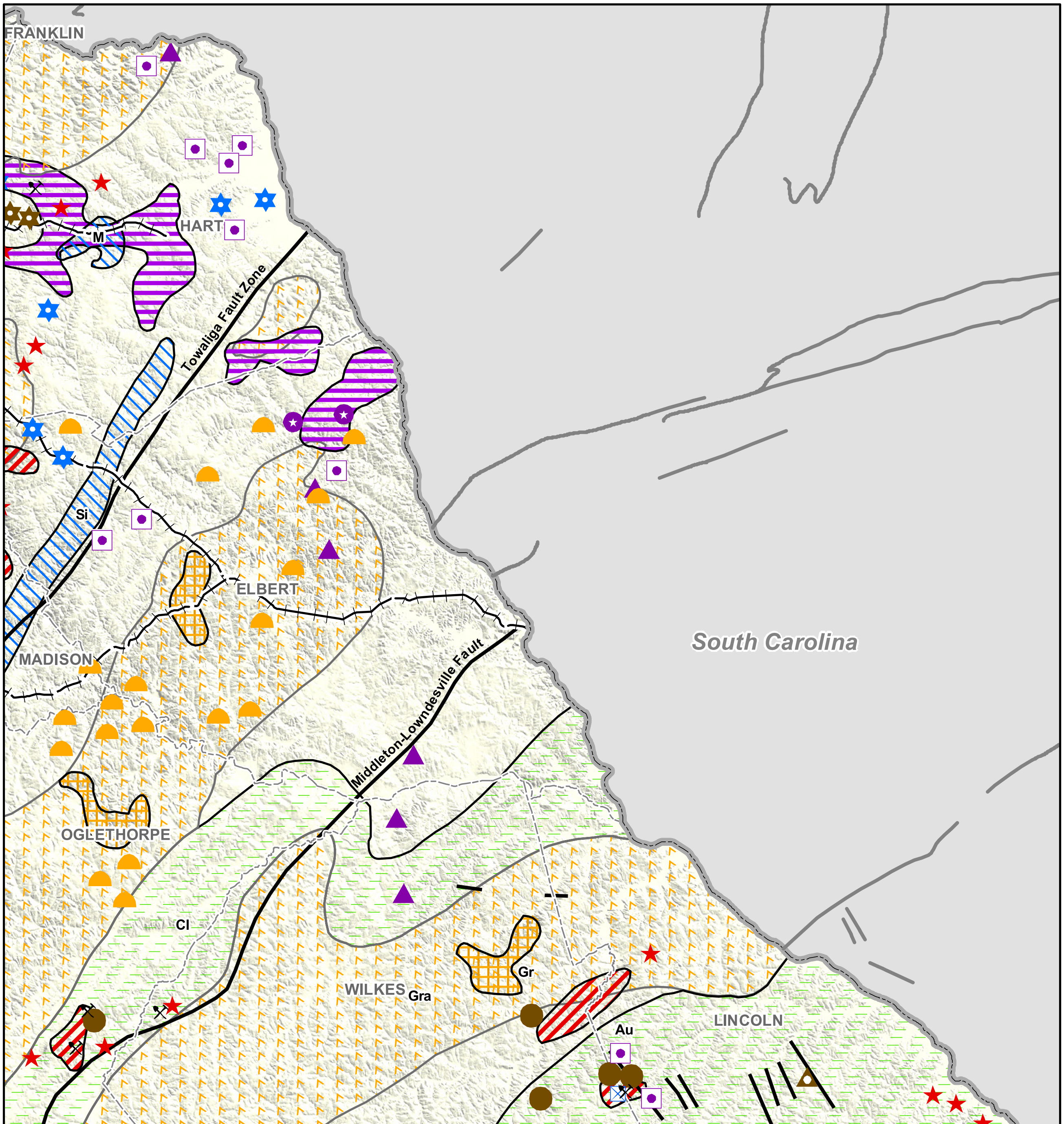
1:500,000

0 5 10 20

Miles

Note: Resource areas and symbols shown on Appendix 2.

Reference: From Mineral Resource Map, 1969, State of Georgia



Appendix 2B-4

Mineral Resources, Mines and Prospects of North Georgia

Geologic Fault Line

Railroad

GNIS Mine

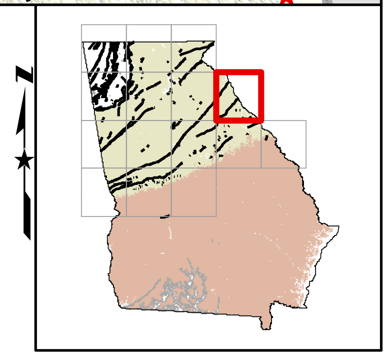
1:500,000

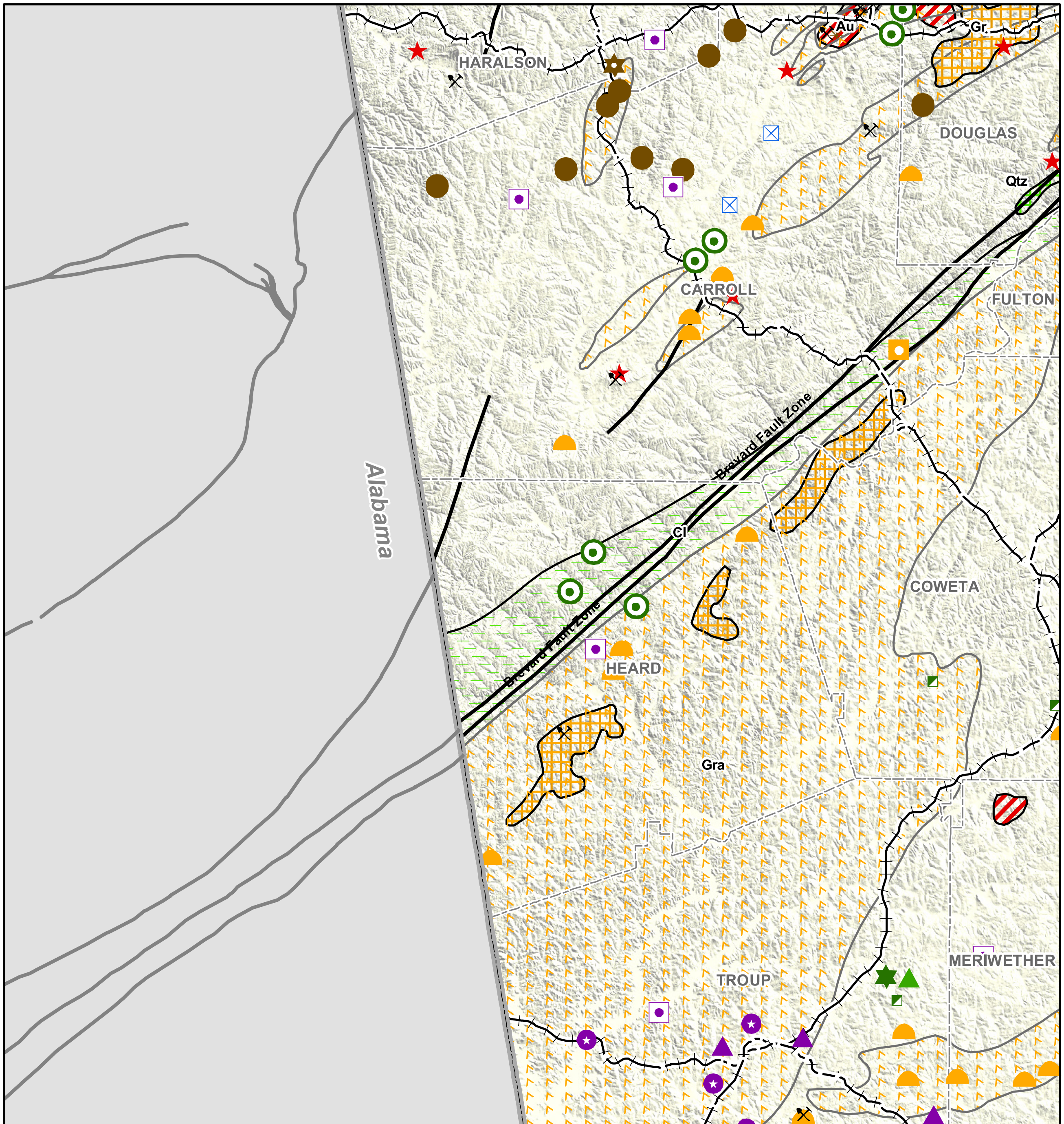
0 5 10 20

Miles

Note: Resource areas and symbols shown on Appendix 2.

Reference: From Mineral Resource Map, 1969, State of Georgia





Appendix 2C-1

Mineral Resources, Mines and Prospects of North Georgia

Geologic Fault Line

Railroad

GNIS Mine

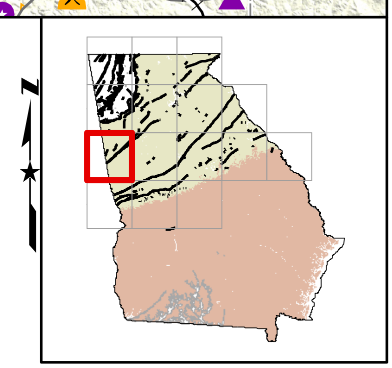
1:500,000

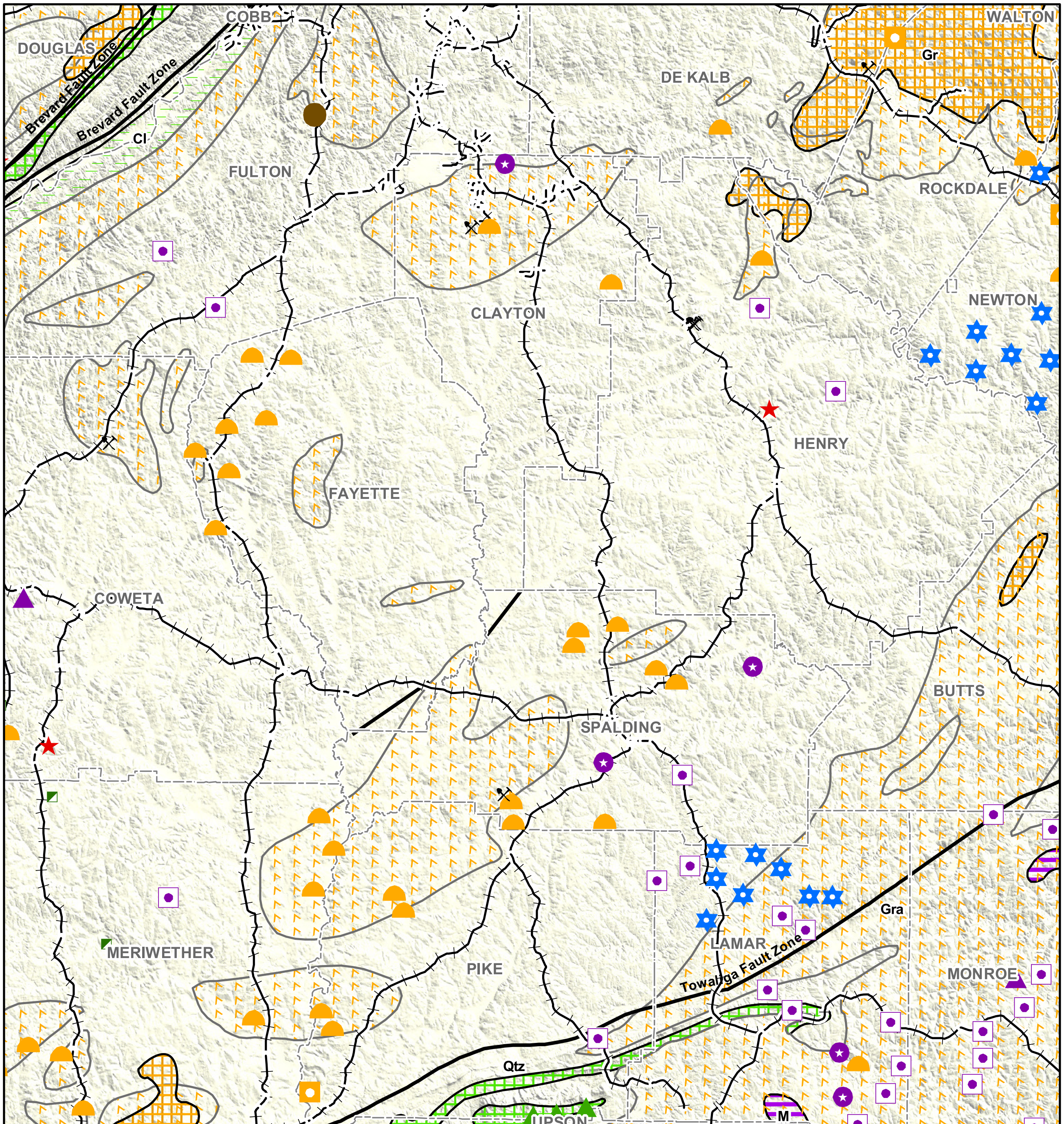
0 5 10 20

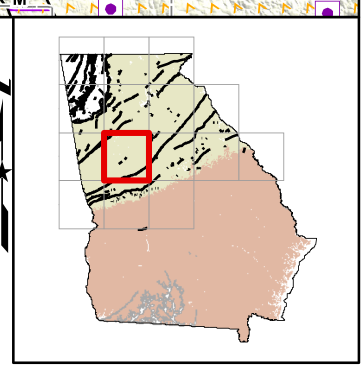
Miles

Note: Resource areas and symbols shown on Appendix 2.

Reference: From Mineral Resource Map, 1969, State of Georgia







Appendix 2C-2

Mineral Resources, Mines and Prospects of North Georgia

Geologic Fault Line

Railroad

GNIS Mine

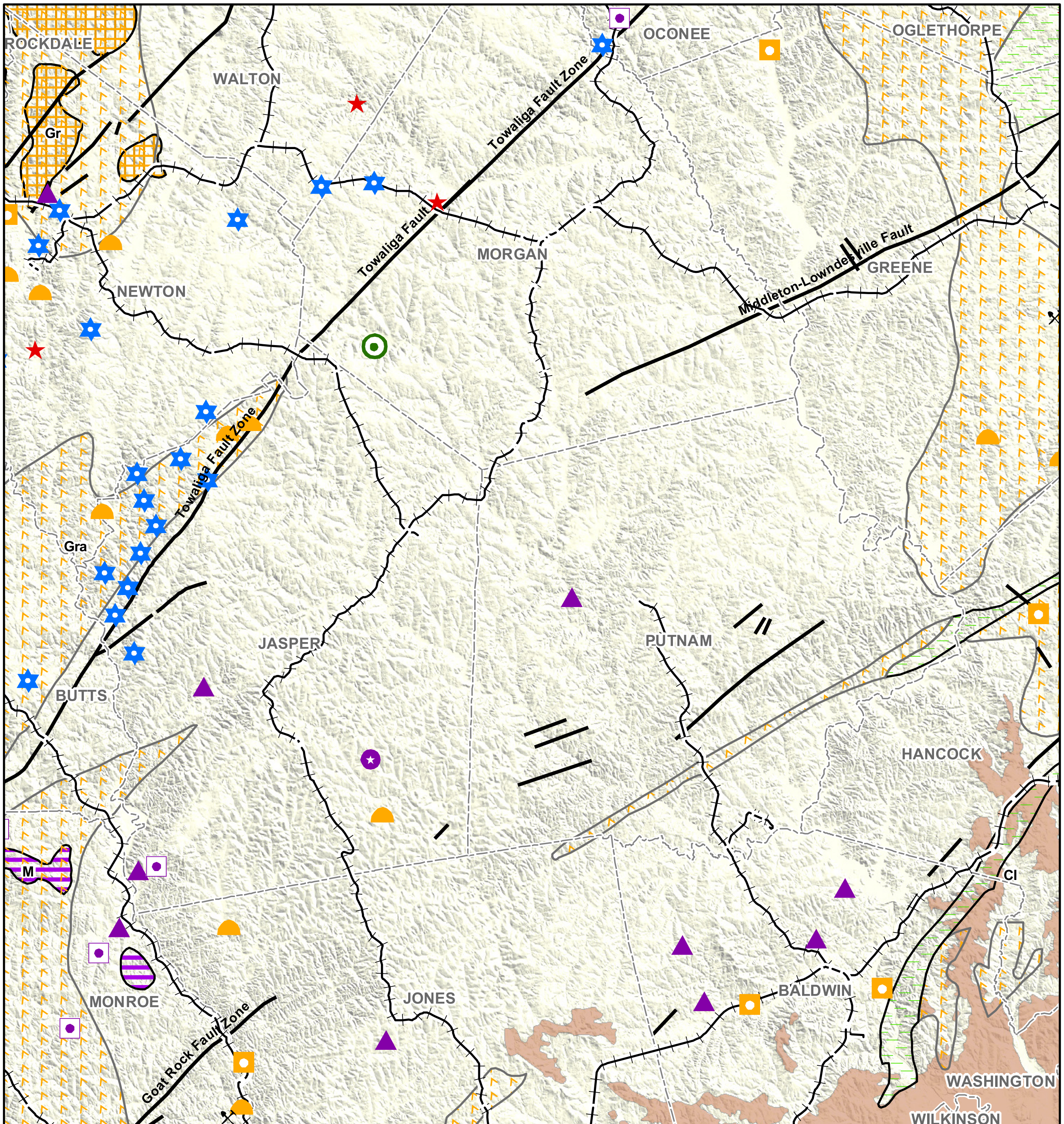
1:500,000

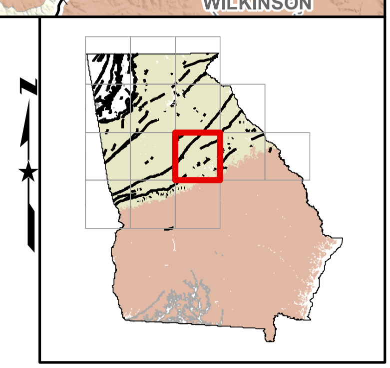
0 5 10 20

Miles

Note: Resource areas and symbols shown on Appendix 2.

Reference: From Mineral Resource Map, 1969, State of Georgia





Appendix 2C-3

Mineral Resources, Mines and Prospects of North Georgia

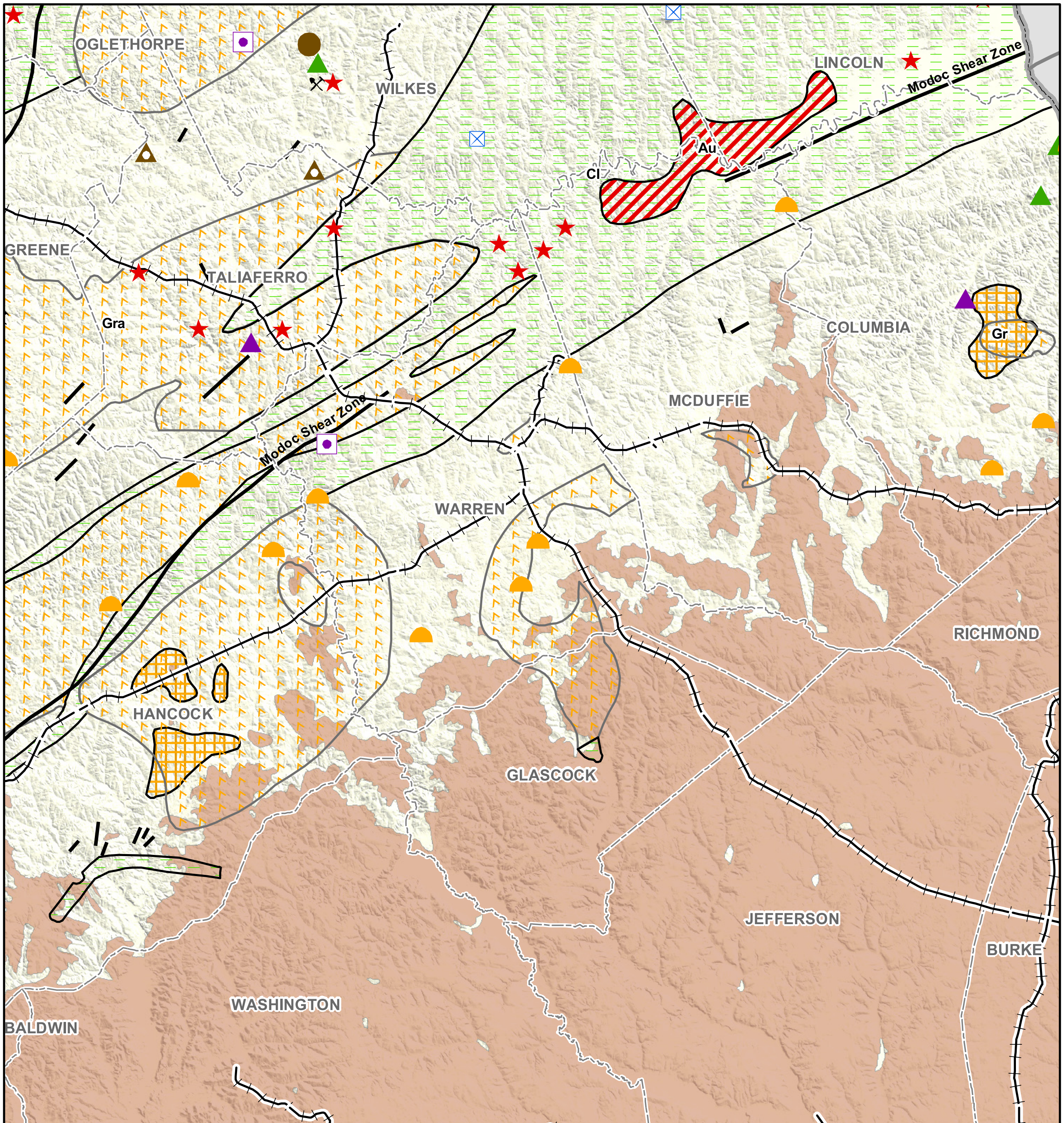
Geologic Fault Line
Railroad
GNIS Mine

1:500,000

0 5 10 20
Miles

Note: Resource areas and symbols shown on Appendix 2.

Reference: From Mineral Resource Map, 1969, State of Georgia



Appendix 2C-4

Mineral Resources, Mines and Prospects of North Georgia

Geologic Fault Line

Railroad

GNIS Mine

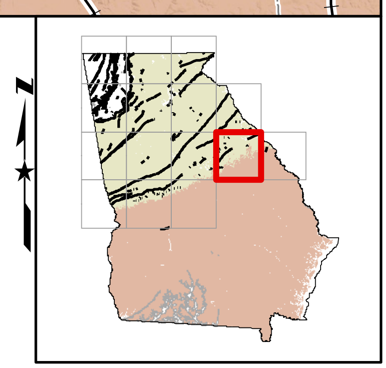
1:500,000

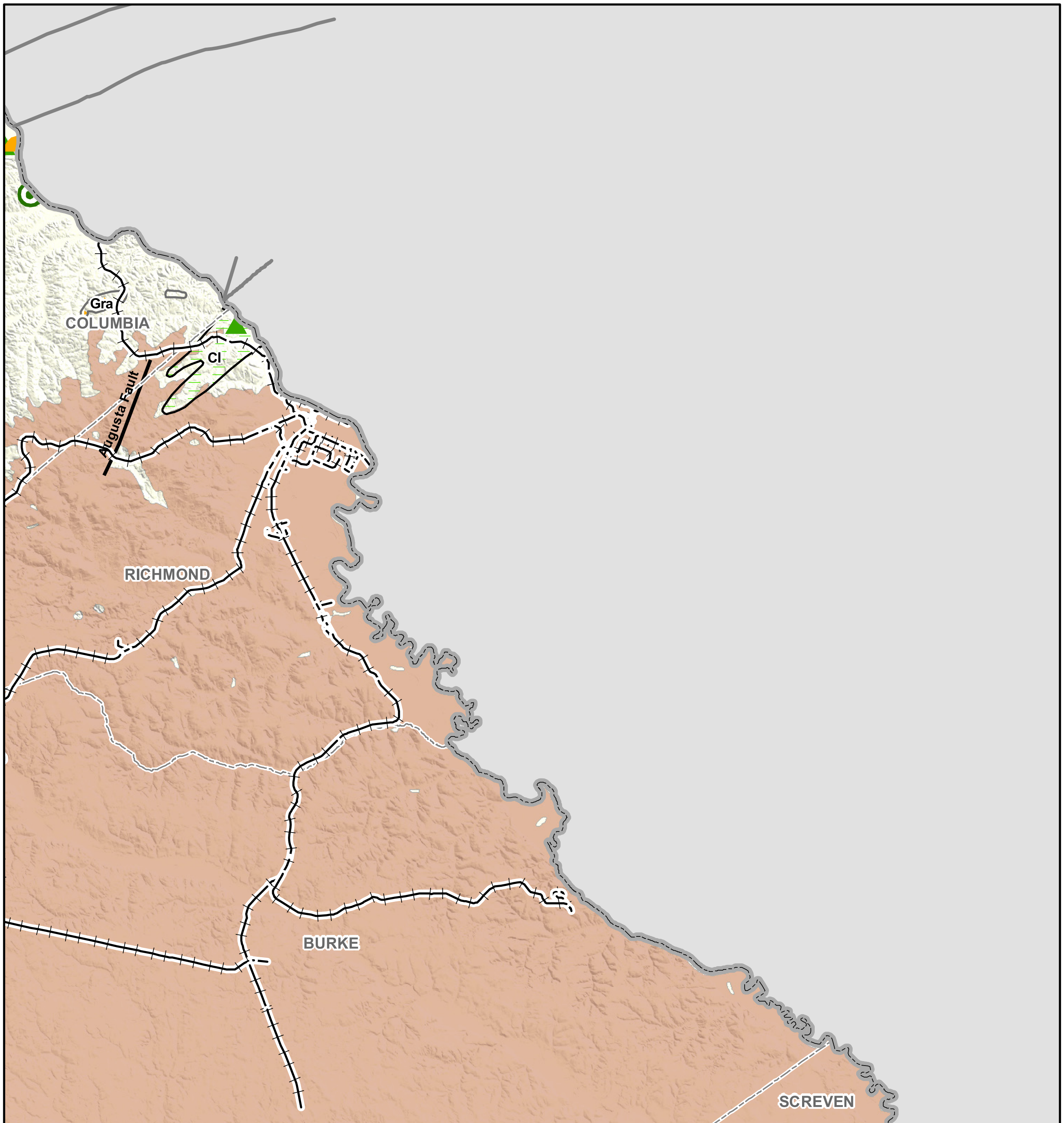
0 5 10 20

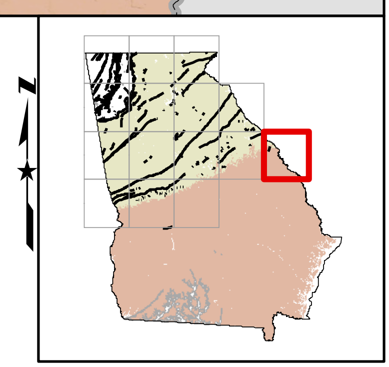
Miles

Note: Resource areas and symbols shown on Appendix 2.

Reference: From Mineral Resource Map, 1969, State of Georgia







Appendix 2C-5
Mineral Resources, Mines and Prospects of North Georgia

1:500,000

0 5 10 20

Miles

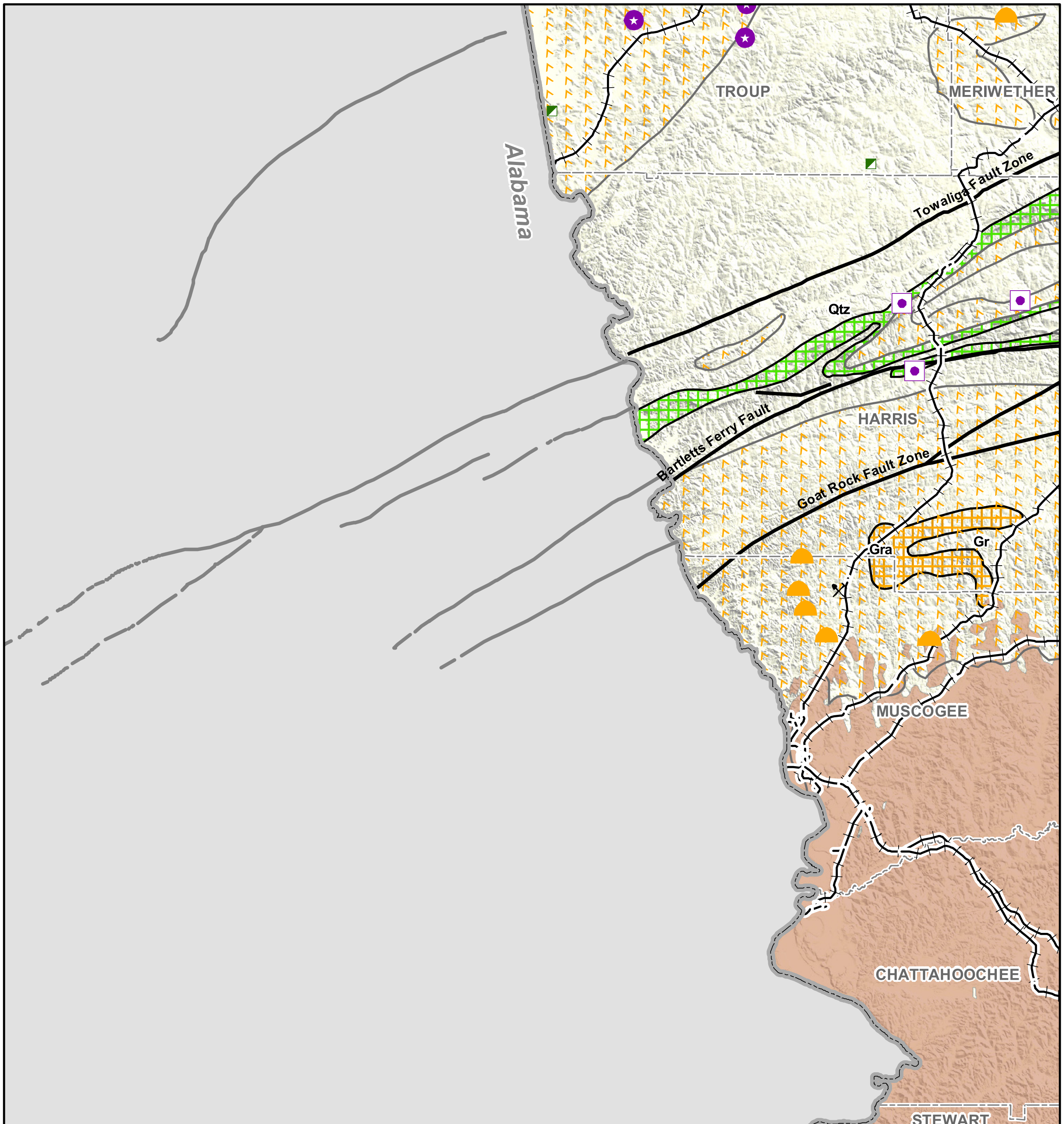
Geologic Fault Line

Railroad

GNIS Mine

Note: Resource areas and symbols shown on Appendix 2.

Reference: From Mineral Resource Map, 1969, State of Georgia



Appendix 2D-1

Mineral Resources, Mines and Prospects of North Georgia

Geologic Fault Line

Railroad

GNIS Mine

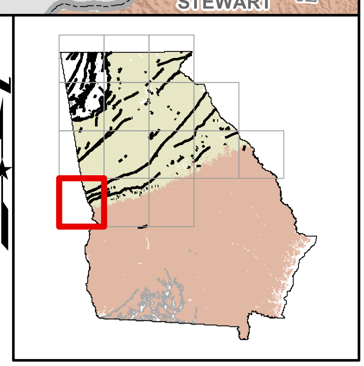
1:500,000

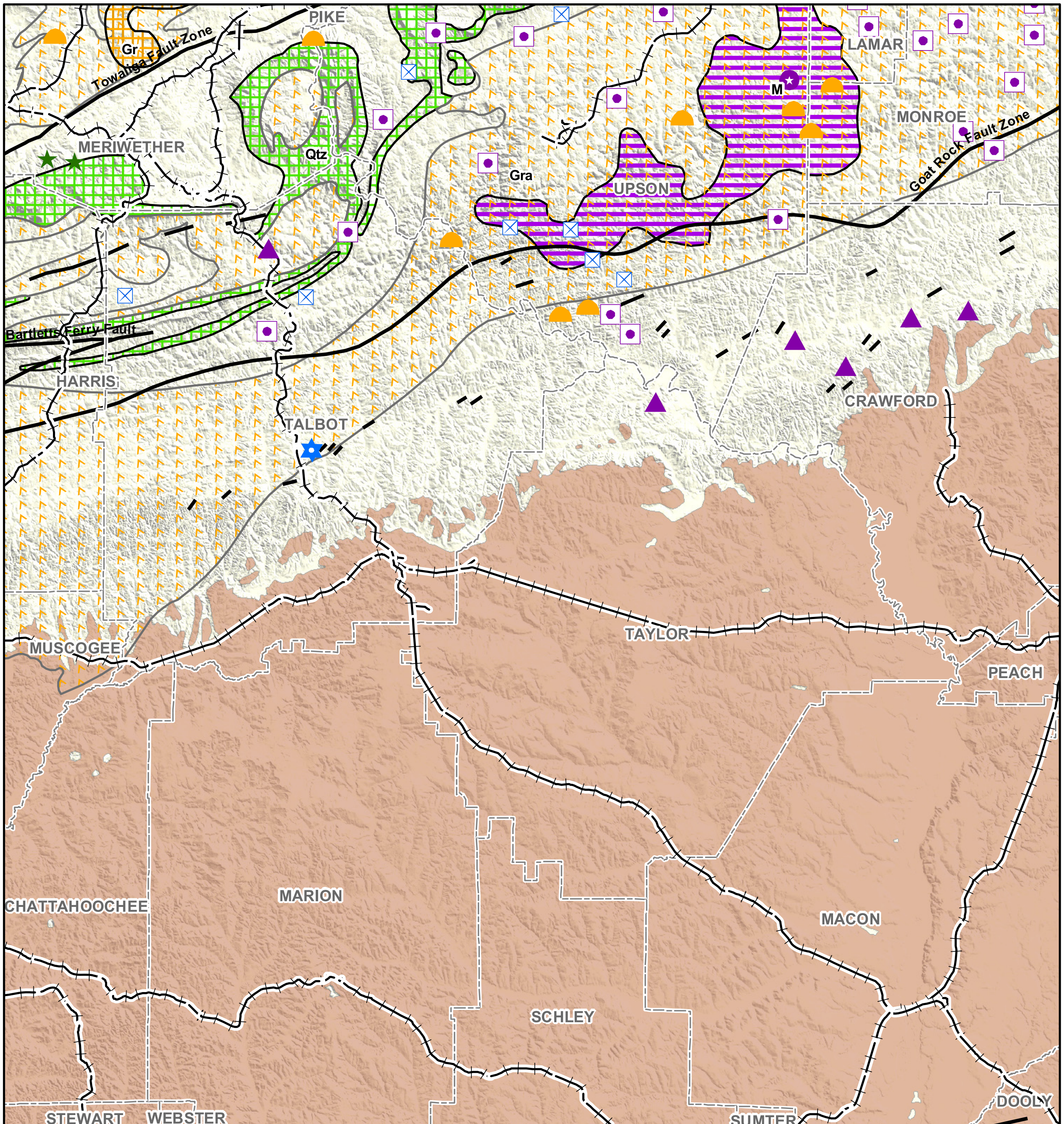
0 5 10 20

Miles

Note: Resource areas and symbols shown on Appendix 2.

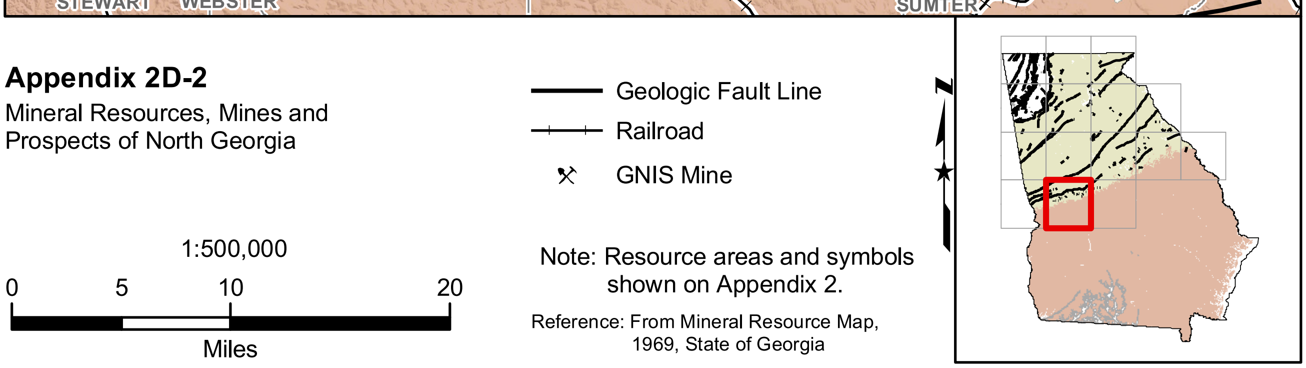
Reference: From Mineral Resource Map, 1969, State of Georgia





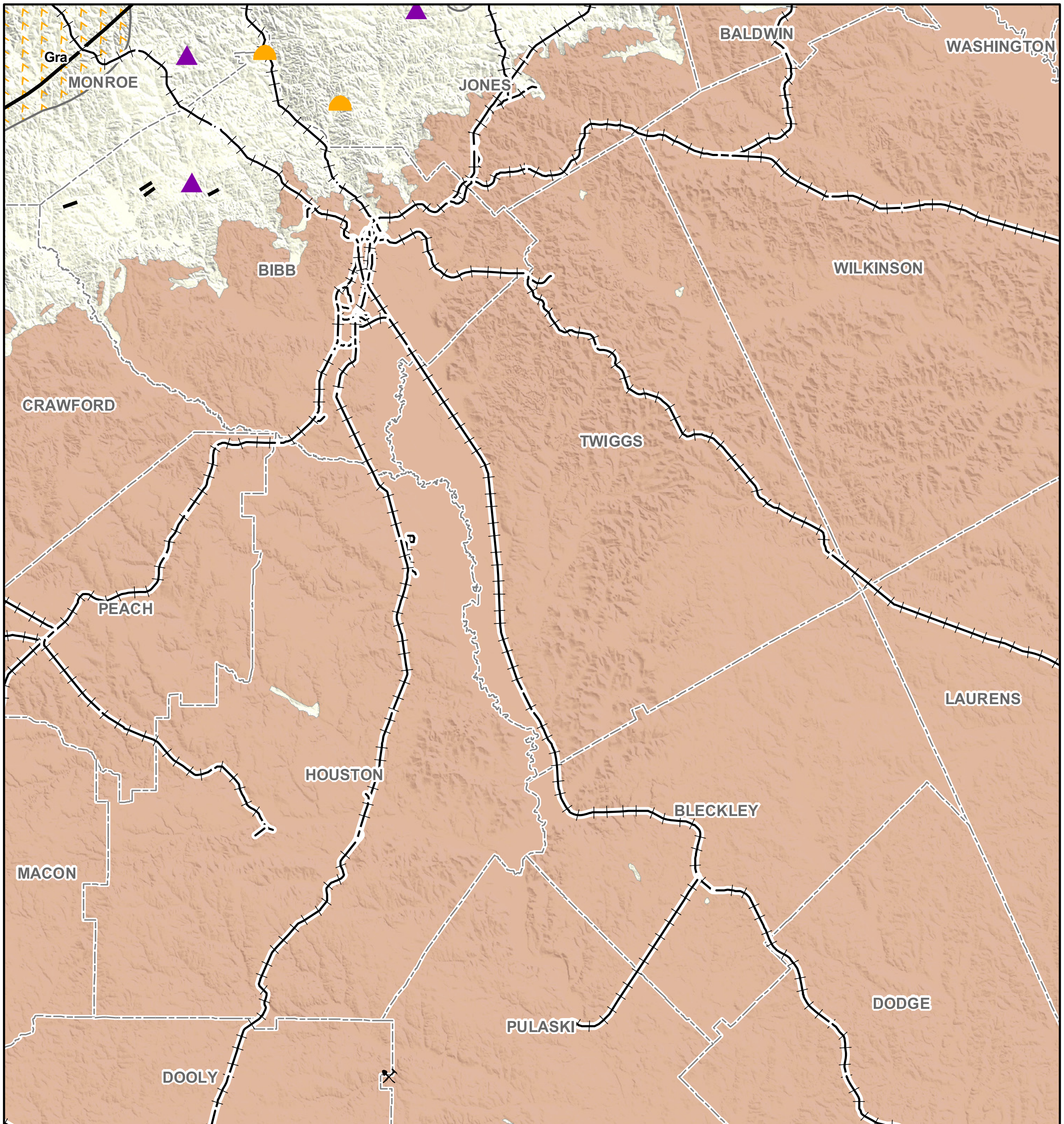
Appendix 2D-2

Mineral Resources, Mines and Prospects of North Georgia



Note: Resource areas and symbols shown on Appendix 2.

Reference: From Mineral Resource Map, 1969, State of Georgia



Appendix 2D-3

Mineral Resources, Mines and Prospects of North Georgia

1:500,000

0 5 10 20

Miles

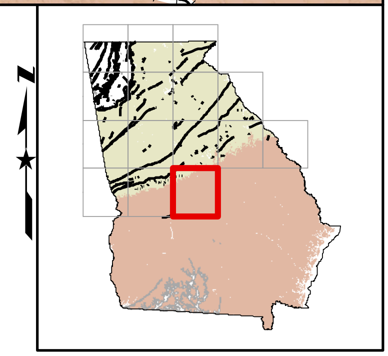
Geologic Fault Line

Railroad

GNIS Mine

Note: Resource areas and symbols shown on Appendix 2.

Reference: From Mineral Resource Map, 1969, State of Georgia



Appendix 3. Mines by Mineral

The tables presented in this Appendix summarize the information recorded on mining properties by the Geological Survey of Georgia. These summaries do not include all of the Geological Survey reports on a particular mineral type, and the data sources that follow each table provide the date ranges covered for each. Researchers should consult the Geological Survey Bulletins for their location and mineral type for a more complete listing of documented mining operations.

ASBESTOS

Sall Mountain Mine	Sall Mountain Asbestos Company	White County	1894-1938	Pit or Quarry
Pig Pen Mountain Mine		Rabun County	1914	Pit or Quarry
W. T. Worley Place		Cherokee County	1914	Pit or Quarry
Miller Property		Rabun County		Pit or Quarry
	National Asbestos Company	Habersham County	1907	Pit or Quarry
	Powhatan Mining Company	Meriwether & Rabun County	????-1952?	Pit or Quarry

Oliver B. Hopkins, *A Report on the Asbestos, Talc and Soapstone Deposits of Georgia*, 1914. Geological Survey of Georgia, Bulletin No. 29.

H. S. Cave, *Historical Sketch of the Geological Survey of Georgia, Bibliography and Other Data*, 1922. Geological Survey of Georgia, Bulletin No. 39.

S. W. McCallie, *A Preliminary Report on the Mineral Resources of Georgia, Revised Edition*, 1926. Geological Survey of Georgia, Bulletin No. 23.

BARITES

Bertha Mine	Bertha Mineral Company	Bartow County, Lots 475 & 476	1916-	
Big Tom Barytes Mine	Big Tom Barytes Company	Bartow County, Lot 895		Open cut
DuPont Mine	E.I. DuPont de Nemours & Company (After 1918) Thompson-Weinman & Company (previous to 1918)	Bartow County, Lots 823 & 762		Open cut
	Krebs Pigment & Chemical Company	Bartow County, Lot 548 & acreage in Lots 533 & 605	1914-1918	Open cut
	New Jersey Zinc Company	Bartow County		
	New Riverside Ochre Company	Bartow County, 39 Acres Lot 533	1914-1915, only ocher afterwards	

Nulsen Mine	The Nulsen Corporation	Bartow County, Lots 691, 692, & 750	1905-	Open cut
Paga Mine No. 1	Paga Mining Company	Bartow County, Lot 819	1916	Open cut
Paga Mine No. 2	Paga Mining Company	Bartow County, Lots 891 & 892	1916	Open cut
	Peebles & Sloan	Bartow County		
	P. F. Renfroe	Bartow County		
Section House Mine		Bartow County, Lot 751		
Paga No. 3 Mine	Georgia Peruvian Ocher Company	Bartow County, Lots 677 & 692	1917-	
Georgia Peruvian Ocher Company	Georgia Peruvian Ocher Company	Bartow County, Lot 764	1915	Open cut
Tucker Hollow Mine	Thompson-Weinman & Company	Bartow County Portions of Lots 476 & 477	1916-1918	
Munford Lot Mine	Etowah Development Company Leased to Thompson-Weinman & Company	Bartow County, Lot 460	1917-1919?	
Parrott Springs Mine	Cherokee Ochre Company leased to Thompson-Weinman & Company	Bartow County, Portions of Lots 459 & 406	March 1916-October 1917	
Clayton Mine	S. P. Clayton (G.H. Aubrey trustee), Leased to Thompson-Weinman & Company who released to H.G. Cope	Bartow County, Lot 479	1917-October 1917	Open cut
Paga No.1, 2, & 3. Mines on Lots 478 & 531	Thompson-Weinman & Company	Leased Lots: (Cherokee Ochre Company- 406, 459, 477, 478, half of 476) (Georgia Peruvian Ochre Company – 531, 532, 692, 764, 765 & 820).		
Mine 531 (originally known as Cope Mine)	Baryte rights belong to Georgian Peruvian Ocher Company & Leased to Thompson-Weinman & Company	Lot 531	Nov. 1917-	
Mine 478	Cherokee Ochre Company, Leased by Thompson-Weinman			
Big Creek Mine	Big Creek Mining Company	Lot 385	1917-	

Iron Hill Mine	Estate of L.S. Munford. Leased to Bertha Mineral Company, a subsidiary of the New Jersey Zinc Company	Lot 786	Extensive Prospecting done in 1919. Little ore was shipped from Lot.	
Barium Reduction Mine				
	Chemical Products Corp.			
	Burgess Battery Company			
	Ladd Lime & Stone Company			
Big Bertha Mine				
Cherokee Barite Mine				
Reservoir Hill				
Slabhouse Mine				

J. P. D. Hull, *Report on the Barytes Deposits of Georgia*, 1920. Geological Survey of Georgia, Bulletin No. 36.

Thomas L. Kesler, *Geology and Mineral Deposits of the Cartersville District, Georgia*, 1950. Geological Survey Professional Paper 224.

BAUXITE

James Holland Property		Floyd County, Lot 61	1888	
Hermitage Furnace Plant	Republic Mining and Manufacturing Company			
Comosema & Barnsley Mines	Georgia Bauxite and Mining Company	Bartow County		
	Dixie Bauxite & Mining Company			
	Southern Bauxite Mining & Manufacturing Company			
Fat John Bauxite Mine		Floyd County		
Gulliver Bauxite Mine (rormerly the Armington Mine)		Walker County		
Church Bauxite Mine		Floyd County		
Watters Bauxite Mine		Floyd County		
	American Cyanamid Company	Macon, Sumter, Bartow		

Thomas L. Watson, *A Preliminary Report on the Bauxite Deposits of Georgia*, 1904. Geological Survey of Georgia, Bulletin No. 11.

H. S. Cave, *Historical Sketch of the Geological Survey of Georgia, Bibliography and Other Data*, 1922. Geological Survey of Georgia, Bulletin No. 39.

S. W. McCallie, *A Preliminary Report on the Mineral Resources of Georgia, Revised Edition*, 1926. Geological Survey of Georgia, Bulletin No. 23.

A. S. Furcron, A. C. Munyan, Garland Peyton, and Richard W. Smith, *Mineral Resources of Georgia*, 1938. Georgia Department of Natural Resources, Division of Mines, Mining and Geology, Geological Survey of Georgia.

CEMENT

	Howard Hydraulic Cement Company	Bartow County		
	Georgia Cement & Lime Company	Bartow County		
	Chickamauga Cement Company	Walker County		
	Southern States Portland Cement Company	Polk County		
	Penn-Dixie Cement Corporation	Houston County		

H. S. Cave, *Historical Sketch of the Geological Survey of Georgia, Bibliography and Other Data*, 1922. Geological Survey of Georgia, Bulletin No. 39.

S. W. McCallie, *A Preliminary Report on the Mineral Resources of Georgia, Revised Edition*, 1926. Geological Survey of Georgia, Bulletin No. 23.

Minerals Yearbook, Area Reports, Volume III, 1952. Published 1955. U.S. Bureau of Mines, Regional Mineral Industry Divisions.

CHLORITE

	American Mica Company			
		Cherokee County		
		Pickens County		

H. S. Cave, *Historical Sketch of the Geological Survey of Georgia, Bibliography and Other Data*, 1922. Geological Survey of Georgia, Bulletin No. 39.

Geoffrey W. Crickmay, *Geology of the Crystalline Rocks of Georgia*, 1952. Georgia State Division of Conservation, Department of Mines, Mining and Geology, The Geological Survey, Bulletin No. 58.

CLAY AND KAOLINS

	Stevens Brothers & Company	Baldwin County		
	Albion Kaolin Company	Richmond County		

	Golding Sons Company	Taylor County		
	American Clay Company	Twiggs County		
	Georgia Kaolin Company	Twiggs County		
	R.H. Jones Company Lessee, J.S. Epps	Twiggs County		
	John Sant & Sons Company	Twiggs County		
	Texmoga Clay Products Company	Walker County		
	Georgia Refractories Company	Walker County		
	Kaolin Mining Company	Wilkinson County		
	Columbia Kaolin & Aluminum Co	Wilkinson County		
	Savannah Kaolin Company	Wilkinson County		
	Edgar Bros. Company	Wilkinson County		
	Akron Pigment Company	Wilkinson County		

Otto Veatch, *Second Report on the Clay Deposits of Georgia*, 1909. Geological Survey of Georgia, Bulletin No. 18.

H. S. Cave, *Historical Sketch of the Geological Survey of Georgia, Bibliography and Other Data*, 1922. Geological Survey of Georgia, Bulletin No. 39.

S. W. McCallie, *A Preliminary Report on the Mineral Resources of Georgia, Revised Edition*, 1926. Geological Survey of Georgia, Bulletin No. 23.

COAL

Dade Coal Mine	Gordon & Russell	Dade County	1870-1890?	Tunnel
Durham Mines	Durham Coal & Coke Company	Walker County?	1891	
Castle Rock Coal Mine	Gordon & Russell	Dade County	?-1878?	
Gordon Mine			?-1881	
Cole City Mine		Dade County		
New South Wales Mine		Dade County	1882-1885	
Elijah Mine		Dade County	1884-1892	
Rattlesnake Mine		Dade County	1890-1899	
Pine Mountain Mine		Dade County	1898-1898	
Ferndale Mine		Dade County	1892-1901	
Raccoon Mine		Dade County	1901-still in operation at time of report-1904	

S. W. McCallie, *A Preliminary Report on the Coal Deposits of Georgia*, 1904. Geological Survey of Georgia, Bulletin No. 12.

S. W. McCallie, *A Preliminary Report on the Mineral Resources of Georgia, Revised Edition*, 1926. Geological Survey of Georgia, Bulletin No. 23.

COPPER

Mobile Mine		Fannin County		
Lot 20		Fannin County	1861-	
Canton Copper Mine		Cherokee County		
Waldrop Copper Mine		Haralson County		
Magruder Mine	Seminole Copper Company			

H. S. Cave, *Historical Sketch of the Geological Survey of Georgia, Bibliography and Other Data*, 1922. Geological Survey of Georgia, Bulletin No. 39.

S. W. McCallie, *A Preliminary Report on the Mineral Resources of Georgia, Revised Edition*, 1926. Geological Survey of Georgia, Bulletin No. 23.

A. S. Furcron, A. C. Munyan, Garland Peyton, and Richard W. Smith, *Mineral Resources of Georgia*, 1938. Georgia Department of Natural Resources, Division of Mines, Mining and Geology, Geological Survey of Georgia.

CORUNDUM

Laurel Creek Mine	Thompson; then purchased by Mr. Lucas of the Hampton Emery Company	Raybun County	Early 1870s-1893	Pit
Track Rock Corundum Mine		Union County		
Edison Mine		Cobb County		

H. S. Cave, *Historical Sketch of the Geological Survey of Georgia, Bibliography and Other Data*, 1922. Geological Survey of Georgia, Bulletin No. 39.

S. W. McCallie, *A Preliminary Report on the Mineral Resources of Georgia, Revised Edition*, 1926. Geological Survey of Georgia, Bulletin No. 23.

A. S. Furcron, A. C. Munyan, Garland Peyton, and Richard W. Smith, *Mineral Resources of Georgia*, 1938. Georgia Department of Natural Resources, Division of Mines, Mining and Geology, Geological Survey of Georgia.

FELDSPAR

Appalachian Minerals Company		North Georgia	????-1951	

S. W. McCallie, *A Preliminary Report on the Mineral Resources of Georgia, Revised Edition*, 1926. Geological Survey of Georgia, Bulletin No. 23.

Minerals Yearbook, Area Reports, Volume III, 1952. Published 1955. U.S. Bureau of Mines, Regional Mineral Industry Divisions.

FULLER'S EARTH

Atlantic Refining Company at Attapulgas (later the Attapulgas Clay Company)		Decatur County		
General Reduction Company in Dry Branch		Grady County		

H. S. Cave, *Historical Sketch of the Geological Survey of Georgia, Bibliography and Other Data*, 1922. Geological Survey of Georgia, Bulletin No. 39.

S. W. McCallie, *A Preliminary Report on the Mineral Resources of Georgia, Revised Edition*, 1926. Geological Survey of Georgia, Bulletin No. 23.

GRANITE AND GNEISS

Stone Mountain	Venable Brothers	DeKalb County	1882-	
Lithonia	New Jersey Zinc Company	Bartow County		
Coggins Quarry		Near Elberton		
Flat Rock Quarry	T.B. Redmond, A.J. Kitchens, J.O. Kirk, Miss M.E. Lasby	Heard County		
Wynn Quarry	J.M. Buttrell, S.B. Heard	Heard County		
Mountville Quarry		Troup County		
A.M. Hill Place (prospect only)	A.M. Hill, O. Ward, G.J. Martin, J.M. Terrell	Meriwether County		
Greenville Granite Company's Quarry	Greenville Granite Company (Dr. E.B. Terrell and B.O. and A.M. Hill)	Meriwether County		
Flat Shoals		Meriwether & Pike Counties		
Odessa Quarry	Georgia Quincy Granite Company	Meriwether County	1896-1899	Quarry
T.B. Tigner Quarry (prospect, local use only)		Meriwether County	1891	
Sam Hill Quarry	Samuel L. Hill	Coweta County	1887-	Quarry
R.D. Cole Quarry		Coweta County	1890-	
Overby Quarry		Coweta County		
J. H. Neely Place (prospect only)		Coweta County		
J.D. Moreland's Property (prospect only)		Coweta County		

Lyndon Hill Property (prospect only)		Coweta County		
McCollum Quarry (prospect, exhibition only)	J.R. McCollum	Coweta County		
Turner Quarry		Spalding County		
Beecher Quarry		Spalding County		
Dickerson Place (prospect only)		Spalding County		
A.J. McElwaney Place (prospect only)		Fayette County		
Bennett's Mill Rock (prospect only)		Fayette County		
Mrs. Cora J. Carmichael's Quarry	Owned by Carmichael and leased by the Patterson Brothers	Campbell County	1898-1903	
Lee Brothers Quarries	Lee Brothers	DeKalb County		
Floyd Quarry	John H. Floyd	DeKalb County, Lot 94	1885-	
Wilson Quarry	James R. Wilson, then sold to Watson & Brantley and Mrs. Bowe	DeKalb County, Lot 133	1891-	
Whitley Quarry	Needham Whitley	DeKalb County, Lot 132		
Bosier Quarry	T.A. Bosier, leased to Lithonia Co-operative Granite Company	DeKalb County, Lot 155	1890-	
Weeks Quarry	John W. Weeks	DeKalb County, Lot 156		
Duncan Quarry	R.S. Duncan	DeKalb County, Lot 165; Lot 187	1896	
Johnson Quarry	G.W. Johnson	DeKalb County		
J.H. Chupp Quarry	J.H. Chupp	DeKalb County, Lot 186	1895	
Goddard Quarry	James Gottard	DeKalb County, Lot 186		
Collinsville Mountain Quarry	Southern Granite Company	DeKalb County		
Crossley Quarry	D.B. Cooper	DeKalb County		
Wade Quarry	T.T. Wade	DeKalb County, Lot 108		
Jenkins Quarry	J.G. Jenkis	DeKalb County		
Cooper Quarry	D.B. Cooper	DeKalb County, Lot 173		

Henderson Quarry (prospect only)	Lawson Smith	DeKalb County		
Brantley Quarry	Lee G. Brantley	DeKalb County		
Arabia Mountain Quarry (prospect only)	J.W.Kelly & William Terry	DeKalb County		
Walker Quarry	G.W. Walker	DeKalb County	1890; 1898	
Johnson Quarry	J.C. Johnson	DeKalb County		
J.L. Chupp Quarries	J.L. Chupp	DeKalb County, Lot 154 & 167	1882-	
Braswell Quarry	Mrs. Avy Braswell	DeKalb County, Lot 158		
Brand Quarry	J.T.Brand	DeKalb County, Lot 169		
Mary Regin & Georgia Railroad Quarry	Mary Regin & Georgia Railroad	DeKalb County		
Southern Granite Company's Quarry	Southern Granite Company	DeKalb County, Lots 154 & 155		
Georgia Railroad Quarry	Georgia Rail Company	DeKalb County		
Pine Mountain Quarries	Venable Brothers	DeKalb County	1883-	
Sawyer Quarry	J. Sawyer	Gwinnett County, Lots 37, 38, & 39		
Snell Quarry		Gwinnett County	1883	
Turner Quarry		Gwinnett County		
Ewing Property	M.E. Ewing	Gwinnett County		
Cates Quarry	G.W. Cates	Gwinnett County		
Tribble and Bennett Property	W.J. Tribble & A. Bennett	Gwinnett County		
Langley Quarry	Thomas Langley	Gwinnett County		
Mayfield Property (prospect only)	E.W. Mayfield	Gwinnett County		
Lawrenceville Quarry	W.L. Vaughan	Gwinnett County		
McElvaney Shoals Property	Nathan Bennett, H.M. Whitworth, A.L. Bell, Robert Livsey, J.T. McElvaney, & Dr. R.A. Hammond	Gwinnett County		
Bush Quarry	W.H. Bush	Gwinnett & Walton Counties		
Saunders Quarry	J.M. Saunders	Jackson County		
Stanton & Dellepierre Opening	Z.F. Stanton & Dr. J.C. Dellepierre	Jackson County		

Rockmore Quarry	J.P. Rockmore	Walton County		
Braswell Opening (prospect only)	W.H. Braswell	Walton County		
Stephen Brand Opening (used for local chimneys)	Stephen Brand	Walton County		
McDaniel Mountain Property	John W. McDaniel; sold to Lithonia Co-operative Granite Company	Rockdale County, Lot 174	1894	
Turner Quarry		Rockdale County, Lot 201	1890	
Reagan Property	E.O. Reagan & Kerr Reagan	Rockdale County		
Brooks Property (prospect only)	Josiah Brooks	Rockdale County		
Tilly Quarry	J.R. Tilly	Rockdale County		
Powell Quarry	C. Anderson	Rockdale County	-1896	
Almand Quarry (prospect only)	D.M. Almand	Rockdale County		
Whittaker Quarry		Rockdale County		
Redwine & James Quarries	J.B. Redwine & John H. James	Rockdale County	1890	
Pierce Quarry	Lucius Brooks	Rockdale County		
Paper-Mill Quarry	Almand & Wellhouse	Rockdale County		
Goode Quarry (prospect only)		Rockdale County		
Perry Property (prospect only)	Perry	Newton County		
Freeman Quarry	Mrs. M.L. Freeman	Newton County		
Linch Quarry		Putnam County		
Marshall Property	Mrs. Marshall	Putnam County		
Charley Rocker Quarry	Charles Rocker, leased to Georgia Quincy Granite Company	Hancock County		
Old Rocker Quarry	Carling, Hertz & Company	Hancock County		
Georgia Quincy Granite Company's New Quarry	Mr. Lee	Hancock County		
Mallally Granite Company	Georgia Quincy Granite Company	Hancock County		
Mackin Property		Hancock County		
Lexington Blue Granite Company's Quarry	McWhorter & Smith	Oglethorpe County		

Diamond Blue Granite Company's Quarry	J.W. Lamar	Oglethorpe County		
Heath Quarry		Oglethorpe County		
Brown & Deadwyler Properties	Mr. Brown & Mrs. Deadwyler	Madison County		
Mary Russell Sisters Property (prospect only)	Miss Mary Russell & her sisters	Madison County		
Eberhart Property		Madison County		
Swift & Wilcox Property	T.M. Swift & W.M. Wilcox	Elbert County	1888-1893	
Fambrough Property	L.C. Fambrough	Elbert County		
Tate & Oliver Property (prospect only)	E.B. Tate & A.S. Oliver	Elbert County		
Fortson Property	A.C. Fortson; leased for 12 years in 1893 by Mr. Swift & Etheridge	Elbert County		
Brewer Property (prospect only)	S. S. Brewer	Elbert County		
Adams Property	R.E. Adams	Elbert County		
Hester Property (prospect only)	T.J. Hester	Elbert County		
Dr. Carlton's Property (prospect only)		Elbert County		
Swift & Ethridge Quarry	T.M. Swift & J.W. Ethridge, from C.F. Alamand	Elbert County	1893-	
Hill Quarry	Dr. N.G. Long from A.P. Deadwyler	Elbert County		
Coggins Quarry	The Coggins Granite Company	Elbert County	1882-	
Deadwyler Quarry (aka Venable & Collins Quarry)	Leased by Venable and Collins from A.P. Deadwyler ; Now owned by the Coggins Granite Company	Elbert County	1891-1893	
Childs Quarry	L.D. Childs from Abner Webb	Elbert County		
Mrs. P. Deadwyler's Property	P. Deadwyler	Elbert County		
Pettus Property	Henry Pettus	Wilkes County, Lot 164	1896	
English Quarry		Warren County		

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GOLD

Ammons Branch Mine		Rabun County, Lot 110	1896	Open cut
Ashbury Property	Capt. Ashbury	White County, Lots 56, 57, 65 & 66	Finished by 1896	
Astinol Company's Property (prospect only)		Douglas County Lots 204, 208, & 209		
Atkinson Property	Governor W.Y. Atkinson	White County, Lot 48	1888	
Avery Mine		Bartow County, Lot 947		Open cut
John Baggett's Property (prospect only)		Douglas County		
Bailey Property		Cherokee County, Lot 971	1840-	Open cut
Baker & Sons Property	John & Fred W. Baker	White County, Lots 162, 158, & 159		
Barlow Mine	The Georgia Company; later S. L. M. Barlow	Lumpkin County, Lots 741, 743, 748, 789, 793, 794, 795, 797, 798, 602, 605, 606, 652, 656, 658, 659, 671-676, & 681, 12th Dist., Lumpkin County	1866-1896, at least	
Barsheba Woody Lot	Weir Boyd and heirs, and Charles Davis and heirs	Lot 725, 12th Dist., Lumpkin County		Shafts
H. W. Bartley Property		Lot 44, 1st Dist., Rabun County	1849	
J. B. Barton Property		Lots 334, 369, 19th Dist.	1856-1880	Shafts
Bast Mine	Pennsylvania National Gold Mining Company of Georgia; Consolidated Gold Mining Company of Georgia; Dahlonega Company, Ltd.	Lot 1035, 12th Dist., Lumpkin County	1879-1896, at least	Open cut
Battle Branch Mine, aka The Dahlonega Mine	Maj. John Hockenhull; W. G. McNelley & John W. Weaver; Lombard & Imboden	Lots 457, 524, 12th Dist., Lumpkin County	1831-1882	Shafts

Belle Mine	Leander Smith	1.5 miles SE of Auraria, Lumpkin County	c. 1881	
Bell Property	Fields, Bell & Company	Lots 329, 900, 15th Dist., Cherokee County	c. 1850s	Shaft
Betz Mine, aka Wing Mine	Hawkins Kelly; Col. Wing and Etowah & Battle Branch Hydraulic Hose Gold Mining Company; John F. Betz	Lot 388, 12th Dist., Lumpkin County	c. 1850s – 1896, at least	Open cut
Blake Property		Lots 26, 47, 4th Dist., White County		
Boly Field Mine	Boling W. Field	Lot 1182, 12th Dist., Lumpkin County	c. 1840-1861	
Bonner Mine	Bonner	Lots 94, 99, 11th Dist., Carroll County	c. 1840-1861; c. 1860s	Open cut
Bowen Lot		Lot 931, 12th Dist., Lumpkin County		Shaft and tunnel
Will Brogden Property		Lot 258, 7th Dist., Gwinnett County		Trenches
Brown Shaft		Lot 19, 9th Dist.		Shaft
Buffington Mine		Lumpkin County	Probably pre-Civil War	
Frank Burt Property		Cherokee County	Probably pre-Civil War	Shaft
Yonah Gold Mines (formerly Tonton, Mercer, & Butt mines)	Calhoun Land and Mining Company	Lots 60-62, 67-69, 89-92, 103-105, 3rd Dist., White County	1800s	
Calhoun Mine	Thomas G. Clemson and others	Lots 164, 165, 11th Dist., three miles S of Dahlonega, Lumpkin County	c. 1840-1885	
Ad. Campbell Mine	Ad. Campbell	Lot 427, 1st Dist., 1st Sect., Forsyth County	1840s	Shaft
Capps Mine	Capps; Ingersoll & TenBrock	Lot 890, 12th Dist., Lumpkin County	1840-1842; c. 1885	Open cut
Carticay Mine		Lot 139, 6th Dist., Gilmer County	Poss. Pre-Civil War	Placers, tunnels

J. C. Casteel		Lot 204, 15th Dist., Cherokee County		Small prospect pits
Cavender's Creek Mining Property	Capt. R. R. Asbury	Lots 360, 361, 373, 376, 377, 386, 388-391, 400, 424, 425, 432, 454, 455, 458, 15th Dist., Lumpkin County	c. 1840s	
Charles Property	Frederick Charles	Lot 77, 3rd Dist, 1st Sect., Forsyth County		Prospects
Chastain Branch Mine		Lot 136, 18th Dist., Towns County		Prospects
Cherokee Mine	McConnell & Putnam	Lot 428, 15th Dist.	1856-1861	Shafts and tunnels
Chestatee Mine	Chestatee Mining Company	Lots 144-146, 167, 11th Dist, & 1041, 1042, 1092, 1186, 1187, 12th Dist., Lumpkin County	1893-1896, at least	Open cuts, tunnels
Childs Mine		White County, Lot 24, 3rd Dist.	-1888	
The Church Lot		Dawson County, 13th Dist. 1st section		
Clarkson Mine	St. Louis Company	Cherokee County, Lot 225, 15th Dist.	1871	Open cut
Cleveland Mine (Baggs Branch Mine)		Lumpkin County	1878	
Clopton Property		Carroll County, Lot 194, 3rd Dist.		Open cut, Tunnel
Coggins Property		Cherokee County, Lot 211, 15th Dist.		
Collins Property		Forsyth County, Lot 450, 1st District	1872	
Columbia Mine		Lumpkin County, Lot 988, 12th Dist.	1882- 1897 at least	Open cut
Conley Mine	Martin Mining Property	White County, Lot 39, 3rd Dist.		

Cora Lee Property		Lumpkin Property, Lot 433, 15th Dist.		
Cox Property		Cherokee County, Lot 901, 15th Dist.		
Coosa Creek Placer Mine		Union County, Lots 85, 86, 87, 93, 94, 95, 124, 129, & 130, 9th Dist.		
Creighton Mine (Franklin Mine)	Creighton Mining Company	Cherokee County	1840	
Crescent Gold Mine	Crescent Gold Mining Company	Lumpkin County, Lots 953, 954, 955 & 1,102, 12th Dist.		Tunnel
Crown Mountain Property (prospect only)	Judge W.W. Murray	Lumpkin County, Lots 947, 948, 986, 987, & 989, 12th Dist.		Tunnel
Culp Property (prospect only)		Cherokee County, Lot 301, 15th Dist.	1850s	
Currahee Mine (prospect only)	Josephus Roberts			
Davis Mine		Cherokee County, Lot 22, 15th Dist.	1893	Shaft
Dean Gold Mine (St. George Property)		White County, Lots 37, 38, & 59, 3rd Dist.	1886	
J.M. Dillard Property		Raburn County, Lots 190 & 191, 2nd Dist.		
Dry Hollow Mine		Lumpkin County, Lot 126, 11th, Dist.		
Dunnaway Property (prospect only)	Leased by Alfred Johnson	Paulding County	1892	Tunnel, Shafts
Durgy Property	Mr. Durgey	Douglas County, Lot 239, 2nd Dist.		Shafts
T.G. Edwards Property (prospect only)		Habersham County, Lot 147, 3rd Dist.	1892	
Ellsworth Mine/Property	Ellsworth Mining Company	Dawson County, Lot 54, 4th Dist.		

Elrod Property (prospect only)		Hall County, Lots 99, 100, 103, & 104, 10th Dist.		
Etowah Mine		Lumpkin County, Lots 117-120, 141, 142, & 178, 15th Dist.		
Evans Property (prospect only)		Cherokee County, Lots 792 & 793, 15th Dist.		
Bright Evans Property (prospect only)		Rabun County, Lot 82, 3rd Dist.	1886	Open cut
T.D. Evans Property		Cherokee County, Lots 829 & 900, 21st Dist.		
Findley Mine		Lumpkin County, Lots, 1,047, 1,038, & 1,087, 12th Dist.	1852-1891	Open cut
Fish Trap Mine	The Dahlonega Company Limited, Previous owners include: W.H & Jesse Satterfield, Mr. Daniel Stambaugh, C.E. Lovell & L.F. Willetts (The Fish Trap Gold Mining Company), leased to R.B. King, re-leased to Mr. Blackmer & Huff, sold through Frank W. Hall to Mr. Marshall A. Phillips, who transferred it to The Dahlonega Company Limited.	Lumpkin County, Lots 932, 933, 934, 944, 945, & 946, 12th Dist.	1840-1893 at least	
Fowler & Parks Property (prospect only)		Forsyth County, Lots 933-937, 3rd Dist. & Cherokee County, Lots 973 & 974, 3rd Dist.		Tunnels, Pits
Frazier Mine	Martin Mining Property	White County, Lot 58, 3rd Dist.		
Free Jim Mine		Lumpkin County, Lot 998, 12th Dist.	1840s-1893	
Garnet Mine	Garnet Water-Power & Mining Company	Lumpkin County, Lots 330, 331, 350- 359, 378, 379, 403, 404, 439, 442, 450 & 451	1886-1888, 1895-1896	Open cut
Georgiana Mine (prospect only)		Cherokee County, Lot 958, 21st Dist.		Tunnel

Glade Mine (prospect only)		Bartow County, Lots 852, 878, 879, & 924, 21st Dist.		Pit
Gold Hill Mine		One mile south of Battle Brand Mine	1878	Tunnels
W.M. Goings Mine	Haskins & Phillips	Bartow County, Lot 808, 21st Dist.		Pits
Gordon Mine	Mr. Geo. A. Gordon, Previously owned by: Mr. Frank Capps, Mr. Hezekiah Kelly (leased from George William Gordon), Sold to George A. Gordon, Mr. W.B. Fry	Lumpkin County, Lots 609, 679, 680, 720, 721, 750, 751, 791, & 792 12th Dist.	1842- 1848, 1892- 1895	Open cut
Griscom Mine	Mary L. Stanley, Previously owned by Harry B. Neal, Samuel Griscom, Geo. M. Stanley leased land to Moore, Clements & Harris, then deeded Mary L. Stanley	Lumpkin County, Lot 996, 12th Dist.	1840s, 1880-1890s	
W.H. Hadaway Property (prospect only)		Cobb County, Lot 271, 20th Dist.		Open cut
Hamby Mine	Martin Mining Property	White County, Lot 60, 3rd Dist.		
Hamby Placer		Rabun County, Lot 43, 3rd Dist.		
Hamilton Mine		Cobb County, Lot 11, 20th Dist.	Abandoned by 1896	Open cuts & Tunnels
Hand Mine	Hand Gold Mining Company, Hand & Barlow United Gold Mines and Hydraulic Works of Georgia	Lumpkin County, Lots 999 & 1,032, 12th Dist.	1860s-1896	Open cuts
Harris Property	J.F. Baxter Esq.	Gwinnett Count, Lot 275, 7th Dist.		Open cut
Hart Mine		Carroll County, Lot 165, 2nd Dist.		Open cut
Hedden Placer Mine	John D. Verner	Rabun County, Lots 99 & 100 3rd Dist.	1840-1850	
Henderson Property (prospect only)	Albert H. Henderson	White County, Lot 35, 1st Dist.		
Hedwig Mine	Christian Wahl, The Chicago & Georgia Company	Lumpkin County, Lots 527-530, 591-601, 660-663, 669 & 670, 12th Dist.	1840-	Open cut
The Wellborn Hill Mine	Chattanooga & Gum Log Mining Company	Union County, Lot 18, 9th Dist.	1883-1889	

Hightower Mine	Daniel Howell & Company	Lumpkin County	1881	
Hobbs Mine		Paulding County, Lot 713, 3rd Dist.		Shafts
Hodges Property		Paulding County, Lot 655, 3rd Dist.		Shafts
Hollins Mine	Camille Gold Mining Company, E.W. Hollins, William Owens	Haralson County, Lot 134, 8th Dist.	1840s- 1886	Shafts
Horner Mine	Josephs Clements, Dr. N.F. Howard, & W.J. Worley, sold to Dahlonega Gold Mining Company	Lumpkin County, Lot 855, 12th Dist.	1880s	
The Horse Vein		Towns County, Lot 1, 17th Dist.		Pits
Payne, Kendrick, Randall, & House Property		Cobb County, Lots 49, 50, 66 & 67, 20th Dist.	Early 19th century	
John J. Howard's Property (prospect only)		Bartow County, Lot 1,224, 21st Dist.		Open cut
Hunt Property		Union County, Lot 55, 9th District	1878	Tunnel, Open cut
Ivey Mine	The Consolidated Gold Mining Company of Georgia	Lumpkin County, Lots 819-821, 860 & 861	1840, 1879-1883	
Jarret Property (see Childs Mine)				
Johnson Property	J.W. Johnson	Hall County, Lot 72, 10th Dist.		
Jones Mine		Lumpkin County, Lot 512, 15th Dist.		
Josephine Mine (formerly the Auraria Mine)	Auraria Mining Company	Lumpkin County, Lots 526, 595, & 1,215, 12th Dist, Lots 17, 18, 48, 49, & 82, 13th Dist.	1840s	Tunnel, Open cut
Jumbo Mine (prospect only)	Judge W.W. Murray & friends	Lumpkin County, Lots 374 & 375, 15th Dist.		
Kellogg Mine (prospect only)	New York Company	Cherokee County, Lot 1,113, 15th Dist.	1888	
J.B. Kemps Property (prospect only)		Cobb County, Lot 272, 20th Dist.		
Keystone Mine	Keystone Company	Lumpkin County	1879-1883	

Kin Mori Mines	Kin Mori Mining Company	Dawson County, Lots 861, 862, 908-911, 926-929, 976-979, 4th Dist.	1883-1888	
Kitchen Property (prospect only)		Cherokee County, Lots 823 & 834, 21st Dist.		Open cuts
La Belle Mine	La Belle Mining Company of New Orleans	Cherokee County, Lots 157 & 205, 15th Dist.	1888-1889	
Lamar Mine	Bidwell & Company	Rabun County, Lot 30, 2nd Dist.	1844-1858	
La Prade Placer Mine (prospect only)		Habersham County, Lot 135, 11th Dist.	1840	
Latham Property		Cherokee County, Lot 805, 3rd District	1852, 1879, 1893	
Lawrence Mine	Hand & Barlow United Gold Mines and Hydraulic Works of GA	Lumpkin County, Lot 951, 12th Dist.	1869-1870, 1876-1878	
Little Property	Dr. E.D. Little & Mr. G.W. Little	Forsyth County, Lot 420, 1st Dist.		
Little & Goodwin Property	Dr. E.D. Little & Mr. Sterling Goodwin	Fulton County, Lot 38, 17th Dist.		
Lockhart Mine	Dahlonega Company, Limited	Lumpkin County, Lots 1,050, 1,085, & 1,086	1862-1873	Open cut, Tunnels
Longstreet Property (prospect only)	Robert Lee Longstreet & Benjamin A. Merck	Hall County, Lot 130, 9th Dist.		
Looper Property (prospect only)	William L. Looper	Dawson County, Lots 1,000, 1,041, & 1,068, 4th Dist.		
Lot 3, 17th District (prospect only)		Towns County	1869	Pits
Lot 20, 9th District		Union County		
Lot 43, 17th District (prospect only)	E.R. Brown	Towns County		
Lot 208, 3rd District	Mr. Thomason		1893	Shaft
Lot 203, 15th District (prospect only)	James Haynes	Cherokee County		
Lot 321, 7th District (prospect only)		Fannin County		Pits

Loud Mine	Mr. Rufus K. Reaves	White County, Lots 39-41, 1st Dist.		
Macou Property (prospect only)		Cherokee County, Lot 158		
Mammoth Mine	William Willim	Hall County		Shaft
Martin Mining Property (Conley Mine & Farm, Nichols Mine, Frazier Mine, Hamby Mine, White-McGhee Mine, Richardson Mine, Russell Mine, Powell Mine, Park's Mine, Oliver Mine)	John Martin	White County, Lots 2, 9-12, 29, 30, 32-37, 39, 57-60, 62-64, 70, 71, 90, 91, 93, 99-101, 126	1860-	
Mary Henry Mine	The Gold Mountain Mill & Mining Company	Lumpkin County, Lots 1,030 & 1,030, 12th Dist.		Tunnel
Matthews Property		Paulding County, Lot 108, 3rd Dist.		
McBrayer Property		Haralson County, Lots 1,207 & 1,230, 20th Dist.		
McCandless Property		Cherokee County, Lot 61, 15th Dist.	1887	Open cut
I.O. McDaniel Property		Bartow County, Lot 1,075, 21st Dist.	1888	
McLain Property		Cherokee County, Lots 721 & 723, 21st Dist.	1891	
McGuire Property	J.F. Castleberry	Dawson County, Lots 912 & 925, 4th Dist.		
Mercer Mines (consolidation of Tonton Mines, Mercer Mines, Butt Mines)	Yonah Land & Mining Company	White County, Lots 60-62, 67-69, 89-92, 103, 104 & ½ of 105, 3rd Dist. Mineral Interest in Lot 14, 6th Dist.		
Merck Property	Taft and Ebler	Hall County, Lot 129, 9th Dist.		Prospect
Merritt Property	Mr. Merritt	White County, Lot 124, 3rd Dist.	1894	Prospect

Michigan Gold Mining Company's Property	Michigan Gold Mining Company	Paulding County, 2 miles SW of Huntsville	1895	Placer mine
Moore and Brogden Property		Gwinnett County, Lots 309, 310, 318, 319, 7th Dist.	c. 1895	Prospect
Moore Girls' Mine	B. J. Patterson (c. 1846)	Rabun County, Lots 58, 59, 1st Dist.	c. 1846; 1888-1896, at least	Placers and mine
Morse Property	Urquhart and Elberts	Dawson County	1895	Placer
Nacoochee Hills Gold Mining Company Property	Nacoochee Hills Gold Mining Company	White County, Lots 5, 6, 9, 25-28, 38-40, 3rd Dist.		
Nancy Brown Mine	Williams and Pruett	Towns County, Lot 34, 17th Dist.	1874-1878	
Newton Mine	Joseph Eller (c. 1850); Bush & Lyons (1872-74); Nicholson & Sons; McIntosh	Towns County, Lot 131, 18th Dist.	c. 1850; 1872-1874; 1870s-1896, at least	Pits
Nichols Mine	A. J. Nichols (c. 1840)	Habersham County, lots 92, 120, 12th Dist.	c. 1840; 1800s	Placers
Norrell Mine	John Norrell; Stewart, Paul & Gullatt; Stewart and Woodward; D. Morrison (1880s)	Lumpkin County, Lots 736, 805, 12th Dist.	1880s	Shafts
Odom Property	Benjamin Parks and Garwin; A. M. Whelchel and Benjamin Parks	Hall County, Lot 111, 11th Dist.	c. 1846; 1894	Open cut
Old Columbia Mine	Columbia Mining Company	Lumpkin County	c. 1881	
Old Gum Log Mine		Union County, Lot 52, 9th Dist.	1800s	
Oliver Mine	Martin Mining Company	White County, Lot 126, 3rd Dist.		
O'Shields Property	Mrs. W. H. Shields	Hall County, Lot 127, 9th Dist.		
Page Property		Rabun County, Lots 44, 45 3rd Dist.		Placers
Palmour Property	Palmour family	Dawson County, Lot 361, 13th Dist., 7 miles NE of Dawsonville		Shafts
Dr. Parker's Property		Paulding County, Lot 410, 2nd Dist.	c. 1846	Placers
Park's Mine		White County, Lot 93, 3rd Dist.		

Parks Property		Hall County, Lot 56, 11th Dist.		
Parks and Fowler Property		Forsyth County, 9 miles W of Cumming, Lots 933-937 (and 973 & 974, in Cherokee County)	1867	Prospect
Pass Property	Beam and Calhoun (c. 1890)	Hall County, Lots 132, 133, 10th Dist.	c. 1850; c. 1890	Prospect, shaft
Payne, Kendrick, Randall and House Properties		Cobb County, Lots 49, 50, 66, 67, 20th Dist., 1.5 miles E of Acworth	c. 1820s; c. 1870s	Placers, shafts
Percy Gold Mine (aka Simmons Property)	Roby Robinson	Gwinnett County, Lot 290, 7th Dist.		
Piedmont Property	Buford Gold Mining Company	Gwinnett County, Lot 304, 7th Dist., 2 miles NE of Buford	1800s	Tunnels
Pine Mountain Property		Douglas County, Lot 206, 2nd Dist.	c. mid-1800s	Open cuts, Shafts
Plattsburgh Property (aka England Mine)	Plattsburgh Gold Mining and Milling Company (1895)	White County, Lot 40, 3rd Dist.	1895-96, at least	
William Poor's Property		Cherokee County, Lots 760 & 826, 21st Dist.		Shaft
Powell Mine		White County, Lot 91, Dist. 3		
Potosi Mine	John Johnson and J. H. Summerall (1894); Potosi Mining and Milling Company (1895)	Hall County, Lot 85, 11th Dist.	C. 1834; 1894-95	
Preacher Mine		Lumpkin County, Lot 995, Dist. 12	c. 1846; 1885	Shafts
Putnam Mine		Cherokee County, Lots 350 & 371, Dist. 15		Placer mine, Shafts
Ralston Mine	Elisha Castlebury (1840s); The Georgia Company and others	Lumpkin County, Lots 726, 728 & 731, Dist. 12	1840-45; 1866-1880	Placer
Reaves Property		White County, Lot 37, Dist. 1		Prospect
Richardson Mill		White County, Lot 71, Dist. 3		

Rider Mine	Samuel Rider; Yahoola River and Cane Creek Hydraulic Hose Mining Company	Lumpkin County, Lot 1058, Dist. 12	c. 1846-1860	Placers, Shaft
Thomas Roach Property		Douglas County, Lot 213, Dist. 2		Prospect
Roberts Property		Gwinnett County, Lot 253, Dist 7		Prospect
Robertson Property	W. C. Robertson	Bartow County, Lot 1097, Dist. 21		Pits
Royal Mine (aka Hollins Mine)	William Owens; E. W. Hollins; Windom & King; others; Royal Gold Mining Company (1896)	Haralson County, Lot 134, Dist. 8, 3 miles W of Tallapoosa	1840s-1880s; 1896	Open cut, Shafts
Rudicil Mine		Cherokee County, Lot 10, Dist 2	c. 1840s-1880s	Placer, Shaft
Russell Mine		White County, Lot 90, Dist. 3		
Rutherford Mine	Williams Rutherford	Lumpkin County	Pre-Civil War	Placer
Saltonstall Mine		Lumpkin County, near Auraria	1881	
Sandow Mine		Cherokee County, Lot 741, Dist. 3	c. 1840-43;	Placer, Open cut, Tunnels
Sawnee Mtn. Property	Hampton & Herman (1895)	Forsyth County, Lots 820, 836, 837, 891-893, 909-914, 960, 963, & 983, Dist. 3	Early prospect;1895-96	Prospect, Tunnels
Settles Property		Forsyth County, Lot 934, Dist. 2		Shafts
Sheffield and Heidt Property		Paulding County, Lot 656, Dist. 3	c. 1845-	Open cuts, Pits
Shelly Property		Gwinnett County, Lot 290, Dist. 7		Open cuts
Shelton Property	J. F. Shelton	Dawson County, Lot 2412, Dist. 13		Open cut
Shockley Lot		Lumpkin County, Lot 891, Dist. 12		
Simmons Property (former Percy Gold Mine)	Roby Robinson	Gwinnett County, Lot 290, Dist. 7		

Singleton Mine	Joseph J. Singleton (1840s); others	Lumpkin County, Lots 1084, 1051, & 1085	c. 1840-1890s	Placers, shafts
Sixes Mine		Cherokee County, Lots 150, 212, 221, & 284, Dist. 15	1830s-	Placer, Shafts, Tunnels
Smith Mine		Rabun County, Lots 103 & 104, Dist. 5	1800s	Placer, Shaft
S. R. Smith Property		Cherokee County, lot 701, Dist. 3		Pits
Southern States Mining and Exploring Company Property	Southern States Mining and Exploring Company	Douglas County, Lots 205 & 212, Dist. 2	1890s	Shafts, Tunnels
Stacy Mine	T. F. Maddox	Carroll County, 4 miles E of Carrollton	c. 1878	
St. George Property		White County, Lots 37, 38, & 59, Dist. 3	c. 1860s- 1896, at least	Placer
Stansill Property		Cherokee County, Lot 848, Dist. 20		Shafts
Stegall Placer	John P. Stegall	Lumpkin County, near Auraria	1888	Placer
Stonesypher Property	R.K. Reaves	Rabun County, Lot 105	1890s	Placers, Tunnels
Strickland Property	Strickland family	Forsyth County, Lots 67 & 68, Dist. 3	Probably pre-Civil War	
Struby Property		Towns County, Lot 67, Dist. 17	1870	Tunnel, Shafts
Tahloneka Branch Placer		Lumpkin County		Placer
Tahloneka Mine, aka Gowdy Lot	Joseph D. Reid and others	Lumpkin County, Lot 1083, Dist. 12	1830s-1896, at least	Prospect shaft
Tanyard Branch Placer		Lumpkin County, Lot 949, in Dahlonega	1800s	Placer
The Glades		Hall County, lots 94 & 99, Dist. 12		Placer
Thompson Property		White County, Lot 102, Dist. 3		Placer

J. W. Thomason Property		Haralson County, Lot 127, Dist. 7		Placer
Todd Lot	N. F. Howard and I. L. Todd	Lumpkin County, Lot 930, Dist. 12		Placer
Tonton Mines, later part of Yonah Land and Mining Company	Yonah Land and Mining Company	White County		
Tripp Property		Cherokee County, Lot 959, Dist. 21		Placer, Tunnels
Turkey Hill Mine	Several operators	Lumpkin County, Lots 163 & 169, Dist. 11	1830s- 1896, at least	Open cut
Turkey Pen Mine		Gilmer County, Lot 145, Dist. 7		Placer
Wells Mine	Wells; E. W. Coleman	Lumpkin County, Lot 1213, Dist. 12	mid-1800s	Shaft
T. N. Westbrook's Property	T. N. Westbrook	Cherokee County, Lot 276, Dist. 2		Placer
Whitaker Property		Gilmer County, Lot 236, Dist. 10		Placer
White Path Mine	W. J. Holt	Gilmer County, Lots 253 & 288, Dist. 7, & Lot 271, Dist. 10	1840s-1896, at least	Placer
White-McGhee Mine		White County, Lot 70, Dist. 3		
C. T. Willbanks Property		Habersham County, Lot 51, Dist. 11		Shaft
Williams Property		Cherokee County, Lot 1120, Dist. 21		Placer
Wills Creek Property		Towns County, Lot 102, Dist. 18	c. 1850s	Pits
Rufus C. Wood Mining Property	Rufus C. Wood, owner	Lumpkin County, Lots 312, 325, 326, 466, 467, 484-487, 494, 495, 497, 510, 511, & 335, Dist. 15		Placer, Pits
Woods Mine	James E. Wood	Lumpkin County, near Auraria		

Worley Mine	Cherokee Milling and Mining Company	Cherokee County, Lots 459 & 460, Dist. 15	c. 1880s- 1896, at least	Placer, Pits
Yahoola Mine	M. H. Van Dyke; later, F. W. Hall and N. H. Hand	Lumpkin County, Lot 1052, Dist. 12	1858-1896, at least	Prospect, Shafts
Yonah Land and Mining Company Property (consolidation of former Tonton, Mercer, and Butt mines)	Yonah Land and Mining Company (formerly Calhoun Land and Mining Company)	White County, Lots 60-62, 67-69, 89-92, and 103-105, Dist. 3	c. 1830- 1896, at least	Placer, Open cuts, Shafts
Yorkville Mine		Paulding County, Lot 331, Dist. 19	1855-1896, at least	Placer

W. S. Yeates, S. W. McCallie, and Francis P. King, *A Preliminary Report on a Part of the Gold Deposits of Georgia*, 1896. Geological Survey of Georgia, Bulletin No. 4-A.

GRAPHITE

Emerson District	Joseph F. Allison	Bartow County	1892-	
	American Graphite Company	Bartow County	1902-	
Sharp Top Mountain		Pickens County		
	Southern Mining & Milling Company	Habersham County	1937	

H. S. Cave, *Historical Sketch of the Geological Survey of Georgia, Bibliography and Other Data*, 1922. Geological Survey of Georgia, Bulletin No. 39.

S. W. McCallie, *A Preliminary Report on the Mineral Resources of Georgia, Revised Edition*, 1926. Geological Survey of Georgia, Bulletin No. 23.

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IRON

Brown Ore Mine		Bartow County		
Ledbetter Mine	North Georgia Mining Company	Polk County, Lots 661, 662, & 665	1889-	
Cherokee Mine		Polk County, Lot 707		
Green Property	Mr. Green	Polk County, Lot 660		
J. H. Dodd Property	J.H. Dodd	Polk County, Lot 732		

A. H. Vandevander's Property	The Cedartown Company	Polk County, Lot 916	1878-1896	
The Fork-Field Ore Bank		Polk County, Lot 988		
Cedartown Company's Property		Polk County, Lot 957		
The Reed Mine	Alabama & Georgia Iron Company	Polk County, Lots 639 & 640	1889-	
Woodstock Ore Bank		Polk County, Lot 663		
The Mann Property		Polk County, Lot 664		
Wood Mine		Polk County, Lots 667 & 702		
Peek Ore-Banks		Polk County, Lots 704 & 737		
Waddell Property		Polk County, Lots 784, 786, 799, 800, &801		
McMeekin Property		Polk County, Lot 571		
Nancy Crocker Property		Polk County, Lot 570		
Ben Hunt Property		Polk County, Lot 573		
J. R. Hunt Property (prospect only)		Polk County, Lots 435, 436, & 502		
Watts Property		Polk County, Lots 1,235, 1,236, & 1,237		
Cannon Property (prospect only)		Polk County, Lots 1,211 & 1,212		
Hampton Property	Georgia and Alabama Mining Company	Polk County, Lotd 146 & 212		
J. Brown Property (prospect only)		Polk County, Lot 286		
Callahan Property		Polk County, Lot 1,214		
W.T. Burge Ore-Bank	J.S. DeVitt	Polk County, Lot 1,239		
James King Property (prospect only)		Polk County, Lot 1,240		

Grady Mine	The Cherokee Iron Company started mining. The land is now owned by Alabama & Georgia Iron, Company	Polk County, Lots 730, 731, 804, 805, 824	1879-18891	
Central Mining Company		Polk County, Lots 878, 879, 880, 897, 953, 954, 955, & 971	1889-1895	
Lindsey Property		Polk County, Lots 966 & 967		
B.J. West Property		Polk County, Lots 453, 510, & 511	1898-	
G.W. Waddell (prospect only)		Polk County, Lot 1,052		
R.H. Brewer Property		Polk County, Lots 951, 974, & 1,025		
Lee Clark Ore-Bank		Polk County, Lot 715		
Camp Property		Polk County, Lot 537		
Green Ore-Bank	Alabama & Georgia Iron Company	Polk County, Lot 1,252	1894-1896	
Simpson Mine		Polk County, Lot 1,241	1889-1892	
Mrs. Kate Hightower's Property		Polk County, Lot 1,118		
James Young's Property		Polk County, Lot 1,190	1890	
Wray Mine		Polk County, Lot 191	1895-at least 1901 (at time of publishing)	
Cox Property		Polk County, Lot 193		
J.S. Young Property (prospect only)		Polk County, Lots 188 & 189		
Nancy Isbell Property (prospect only)		Polk County, Lot 267		
R.B. Brewster Property		Polk County, Lot 243		
Tumlin Property		Polk County, Lot 244		
Shiloh Church Property (prospect only)		Polk County, Lot 105		

Georgia Loan & Trust Property (prospect only)		Polk County, Lot 113		
C.M. Isbell Property (prospect only)		Polk County, Lot 106		
J.F. Sloan Property		Polk County, Lot 40		
Noble Bank Property	B.M. Jones	Polk County, Lots 32 (2nd district) & 32 (16th district)		
Vandevander Property		Polk County, Lot 42	1895-	
J.E. Pittman Property		Polk County, Lot 115		
State-Line Bank	The Tecumseh Iron Company	Polk County	1875	
Etna Furnace Company's Property		Polk County	1871-1901	
J.M. Prior Company	J.M. Prior	Polk County, Lot 128	1892	
C.A. Wood Property		Polk County, Lots 58 & 88	1888-1892	
Oredell Property	The Republic Mining & Manufacturing Company; Sold in 1891 to Mr. E.W. Marsh : Sold 1901 to J.D. Lacey	Polk County	1876- at least 1902 (time of printing)	
J.A. Wright Property		Polk County, Lot 62		
Hematite Property	Alabama Consolidated Iron, Coal, & Coke Company, leased to the Hematite Mining Company	Polk County	1874-	
Earl Sloan Ore-Bank	A.W. Byrd	Polk County, Lot 20		
J..O. Waddell's Property		Polk County, Lot 400		
McGee Property	Central Mining Company	Polk County, Lots 341 & 401	1888-1893	
James Long Property		Polk County, Lots 326 & 327		
T.M. Randall Property	Central Mining Company	Polk County, Lot 190	1892	
Black Rock Bank	Tecumseh Iron Company	Polk County, Lots 43 & 106	1891	
S.K. Hoge Bank	W.L. Craig			

Deaton Mine		Polk County, Lots 64 & 81	Exhausted by 1902	
Red-Ore Bank	Central Mining Company	Polk County, Lot 509	1894	
C.M. Jones	Citico Iron Company	Bartow County, Lots 966, 978, 1,039, 1,040 & 1,050	1876	
J.A. Stephens Property	J. A. Stephens	Bartow County, Lot 981		
John P. Stegall Property		Bartow County, Lots 980, 979, 894	1870	
P.H. Larey Property		Bartow County, Lots 671 & 750	1889	
Bartow Furnace Company Property		Bartow County, 1,000 acres; Lots 903	1862-1877	
Roan Iron Company's Property		Bartow County, Lot 680	1877	
Allatoona Ore-Bank	Etowah Iron Company	Bartow County, Lot 729	1877-1891	
Wheeler Ore-Bank	Etowah Iron Company	Bartow County, Lot 648		
Iron Ore Deposit	Etowah Iron Company	Bartow County, Lot 575		
Lot 612	Etowah Iron Company	Bartow County, Lot, 612		
Lot 576	Etowah Iron Company	Bartow County, Lot 576	1899-	
Lot 541	Etowah Iron Company	Bartow County, Lot 541		
Lot 616 (prospect only)	Etowah Iron Company	Bartow County, Lot 616		
Hurricane Hollow Ore-Banks	Etowah Iron Company	Bartow County, Lots 400 & 465		
Lot 253 (prospect only)	Mark Cooper	Bartow County, Lot 253		
The Crow Bank	Moore & Thomas	Bartow County, Lot 728		
Stephens & Larramore Property		Bartow County, Lot 506		
W. P. Larramore Property		Bartow County, Lot 471		

Guyton Ore-Bank	Southern Mining Company	Bartow County, Lot 200	1873-1892	
Lowery Ore Bank, Mumford Ore Bank		Bartow County, Lot 201	1891, 1893	
D. J. Guyton Property		Bartow County, Lot 235		
Bishop Ore Bank	Renfroe & Sons	Bartow County Lot 275		
Burford Ore Bank, No.1, Burford Ore Bank No. 2		Bartow County, Lot 301	1860s-1890; 1888 & 1889	
Wild Cat Bank		Bartow County, Lot 312		
Conner Bank		Bartow County, Lot 181		
Big Mountain Ore-Bank		Bartow County, Lot 182		
Sugar Hill Ore-Banks	Iron Belt Railroad and Mining Company	Bartow County		
Cripple Creek Ore Bank	Iron Belt Railroad and Mining Company	Bartow County, Sugar Hill District	Exhausted by 1902	
Pine Hill Ore Bank		Bartow County, Sugar Hill District		
Bluff Ore Bank		Bartow County, Sugar Hill District		
Gordon Property (prospect only)	Iron Belt Railroad & Mining Company	Bartow County, Sugar Hill District		
J.J. Bennett Property (prospect only)	J.J. Bennett	Bartow County, Lot 296		
Peachtree Banks		Bartow County, Lot 148		Open cut
A.H. Morris Property (no prospecting has been done)		Bartow County, Lot 376		
Collar Property		Bartow County, Lot 444		
R.L. Griffin Property		Bartow County, Lot 426		
J.C. Kerr Property	L.S. Mumford	Bartow County, Lot 100	1887-?	
J.M. Copp Property		Bartow County, Lot 102		
Sheats Property		Bartow County, Lot 9		

Veach Property (prospect only)		Bartow County, Lot 8		
Bartow Iron Mines	F.D. Smith, F.W. Knight, and W.M. Hardy. Previously owned by the Tennessee Co, Felton Mining Co, & the Bartow Furnace Company	Bartow County, Lots 901, 902, 903, 904, 969, 970, & 971	1862-1885, 1905, 1917-1927, 1936-?	Open cut
Bufford Mountain, Mine 30 & Mine 31	J.M. Neel	Bartow County, Lots 276 (Mine 30) & 301 (Mine 31)	Mine 31 (1860s-1890), Mine 30 (1900)	
Burgman Property		Bartow County, Lot 83		
A.C. Holt Property		Bartow County, Lot 65		
State Ore-Banks	Property of the State Deaf & Dumb Asylum	Floyd County, Lot 997		
T.W. Asbury Property	Georgia & Alabama Mining Company (as of 1902)	Floyd County, Lots 950 & 951	1888-? (by 1902 it had been closed for some time)	
J.J. Wiggins Property		Floyd County, Lot 948	1895-at least 1900	
T.M. Gordon Property (prospect only)	Georgia & Alabama Mining Company	Floyd County, Lots 994 & 1,023		
J.B. Scott Property (prospect only)		Floyd County, Lot 953		
Bobo Bank		Floyd County, Lot 692	1891-1896	
H. Washington Property		Floyd County, Lot 61		
J.C. Reese Property		Floyd County, Lot 49		
Minter & Howell Properties		Floyd County, Lots 12,13, & 14, Silver Creek District		
Solon Gwinn's Property		Dade County, Lot 185	Worked early 1880's	Open cut
Slaton Property (prospect only)		Dade County, Lot 286		
Tatum & Gilbert Properties		Dade County, Land Lots 322 & 326		
G.A.R. Bibble's Property		Dade County, Land Lot 2		

W.P. Gilbert's Property (prospect only)		Dade County, Lot 36		
T.B. Blake's Property		Dade County, Lot 118		Open cut
E.M. Thomas' Property		Dade County, Lot 127		Open cut, Tunnels
Sarah Hartline's Property (prospect only)		Dade County, 100 yards south of Sulphur Spring Station		
Dean Property		Dade County, Lot 65 (?)		
L.S. Collier's Property	L.S. Collier	Dade County, Lots 64 & 45		
Smith Property		Dade County, Lots 56		
W.A. Allison Property		Dade County, Lot 55		
Thomas Payne's Property (prospect only)	Mineral Interest owned by L.S. Collier	Dade County, Lot 53		
Tinker Property		Dade County, Lots 50 & 51		
Silas Pricket's Property		Dade County, Lot 42 (?)		
Phoenix Iron & Coal Company	Pheonix Iron & Coal Company, previously owned by Empire State Coal & Mining Company	Dade County, 3,224 acres in northern part of 18th district SPECIFIC LOTS DESCRIBED BELOW		
Lot 22	Phoenix Iron & Coal Company	Dade County, Lot 22		
Lot 35	Phoenix Iron & Coal Company	Dade County, Lot 35		
Lot 37	Phoenix Iron & Coal Company	Dade County, Lot 37		
Lots 10, 18, & 23	Phoenix Iron & Coal Company	Dade County, Lots 10, 18 & 23		

New England Company	New England Company	Dade County, approx. 16,000 acres located in districts 10th, 18th, & 19th SPECIFIC LOTS DESCRIBED BELOW		
Lot 5	New England Company	Dade County, Lot 5		Open cut
Lot 8	New England Company	Dade County, Lot 8		
Lot 37	New England Company	Dade County, Lot 37		
Lot 251	New England Company, Formerly owned by Cherokee Iron Works	Dade County, Lot 251	1865-?	
Lot 212	New England Company	Dade County Lot 212		
Lot 186	New England Company	Dade County, Lot 186		
Lots 173 & 174	New England Company	Dade County, Lots 173& 174		
Lot 152	New England Company	Dade County, Lot 152		
Lots 136, 135, 119, & 98	New England Company	Dade County, Lots 136, 135, 119, & 98		
Lots 114, 128, 129, 149, & 177		Dade County Lots 114, 128, 129, 149, & 177	1880s	
Sutton Property		Dade County, Lot 321	1880s	Open cut
D. Martin's Property		Dade County, Lots 50 & 59		
West Property	Chickamauga Iron Company	Walker County, Lot 199	Mined during 1902	
Long Lot	Moses Long	Walker County, Lot 234	Being mined in 1900	
Lot 25	Dayton Iron & Coal Company	Walker County, Lot 25	1880's	
Wisdom Property	Mineral Interest belongs to Chickamauga Company	Walker County, Lot 270	Being mined in 1900	
Frank Costello's Property	Frank Costello	Walker County, Lot 271	Being Mined in 1900	

M.M. Phillip's Propery	M.M. Phillip	Walker County, Lot 308	Mined Prior to 1890	
Thomas Coulter's Lot	J.D. Stephens	Walker County, Lot 193		Open cut
Kensington Iron & Coal Company	Southern Steel Company leases the property from Kensington Iron & Coal Company	Walker County, Lots 220, 249, 254, 255, 287, 288, 289 (dist. 8) 289, 307, 341 (dist. 11)		Open cut, Mines
Estelle Mining Company	Estelle Mining Company	Walker County, Lots 289		
J.L. Warrenfel's Property		Walker County, Lot 172	Spring 1899	
Virginia Iron Coal & Coke Company	Virginia Iron Coal & Coke Company	Walker County, Lots 77, 105, 111, 146, 147, and all of 7th dist.	1889-1900	Stripping
D.J. Hammond's Property		Walker County, Lots 179 & 182	Mining finished by 1900	
Dickenson-Cameron Property		Walker County, Lot 181	1890	
J.A. Williams' Property		Walker County, Lot 216	1900	
E. L. Thurman's Property		Walker County, Lot 304		
Georgia Iron & Railroad Company's Property		Walker County, Lot 70	Mined Prior to Civil War	
Mrs. Alice Park's Property	Alice Park, Mined by C.A. Hall	Walker County, Lot 176	1904-1905	
W.C. McFarland's Property		Walker County, Lots 78, 67, & 42		
A.J. Neal's Property		Walker County, Lot 122		
W.T. Henry's Property		Walker County, Lot 171		
Lot 210	Menlo Iron Company & Woodstock Iron & Coal Company	Walker County, Lot 210		
Lot 222	Dalton Iron & Coal Company	Walker County, Lot 222		
Dirtseller Mountain	Rome Furnace Company	Chattooga County	1888-1908	
I.W. Maddox's Property		Chattooga County, Lots 160 & 161	1898-1908	Open cut

W.F. Kyle's Property		Chattooga County, Lot 144	Early 1900's	Open cut
T. Hiles' Property		Chattooga County, Lot 106		

S. W. McCallie, *A Preliminary Report on a Part of the Iron Ores of Georgia, Polk, Bartow, and Floyd Counties*, 1900. Geological Survey of Georgia, Bulletin No. 10-A.

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KYANITE

	Southern Mining & Milling Company	Habersham County		

A. S. Furcron, A. C. Munyan, Garland Peyton, and Richard W. Smith, *Mineral Resources of Georgia*, 1938. Georgia Department of Natural Resources, Division of Mines, Mining and Geology, Geological Survey of Georgia.

LIMESTONE

Billy Walker Quarry		Near Panther Creek mouth, Habersham County	c. 1880 – 1912, at least	Pit, for lime
C. L. Deal Quarries	C. L. Deal Manufacturing Company	Two miles south of Gainesville, Hall County	1864 – 1912, at least	Pit, for lime
		One mile east of Mineral Bluff, Fannin County		Pit, for marble
Dickey Property		At Toccoa River, Fannin County	c. 1900	Pit, for marble
Holt Property		Near junction of Big & Little Turniptown Creek, Gilmer County		Pit, for lime and some limestone
North Georgia Marble Company Quarry	North Georgia Marble Company	Tioga, Gilmer County	1907 – 1912, at least	Pit, for marble

King Marble Company Property	King Marble Company	Whitestone, Pickens County		Pit, for marble
Detroit Marble Company Property	Detroit Marble Company	Near Whitestone, Pickens County		Pit, for crushed marble
Whitestone Marble Company Property	Whitestone Marble Company	Whitestone, Pickens County		Pit, for crushed marble
Crystal Marble Company Property	Crystal Marble Company	Whitestone, Pickens County		Pit, for crushed marble
		Two miles NE of Jasper, Pickens County	1884 – 1912, at least	Pit, for marble
Perseverance Quarry		Near Jasper, Pickens County		Pit, for marble
Georgia Marble Company Quarries	Georgia Marble Company	Tate, Pickens County		Pit, for marble
Southern Marble Company Quarries	Southern Marble Company	Marble Hill, Pickens County		Pit, for marble
Amicalola Marble Quarries	Amicalola Marble Company	One mile S of Marble Hill, Pickens County		Pit for marble, crushed stone, lime
Marble Hill		Rockmart, Polk County		Pit, for lime
Ellis Davis and Son Slate Quarry	Ellis Davis and Son	Rockmart, Polk County		Pit for shales for Portland Cement
Rockmart Shale Brick and Slate Company Quarry	Rockmart Shale Brick and Slate Company	Rockmart, Polk County		Pit, for Portland Cement
Southern States Portland Cement Company quarries (Quarry No. 1 and 2)	Southern States Portland Cement Company	Rockmart, Polk County	1903 – 1912, at least	Pit, for slate and Portland Cement
Piedmont Portland Cement Company Quarry	Piedmont Portland Cement Company	Portland, Polk County	1909 – 1912, at least	Pit, for limestone for Portland Cement
Georgia Portland Cement and Slate Company Property	Georgia Portland Cement and Slate Company	Four miles NE of Rockmart, Polk County		Pit, for limestone and shale
Southern Lime Manufacturing Company Quarry	Southern Lime Manufacturing Company	Aragon, Polk County	c. 1900 – 1912, at least	Pit, for limestone and lime
Bald Mountain Portland Cement Company Property	Bald Mountain Portland Cement Company	Aragon Springs, Polk County		Pit for limestone

Deaton's Iron Ore Pit				Pit, for iron ore and limestone
Huffaker Limestone Quarry		Huffaker Station, Floyd County		Pit, for limestone
Floyd County Quarry		Rome, Floyd County		Pit, for limestone for road material
Buckles Limestone Quarry	William Buckles	Chelsea, Chattooga County	1909	Pit, for lime
Southern Iron and Steel Company Limestone Quarries	Southern Iron and Steel Company	Rising Fawn, Dade County	Late 1800s	Pit, for limestone
Chickamauga Cement Company Quarries	Chickamauga Cement Company	Rossville, Walker County	1900 – 1912, at least	Pit, for lime
Trouth and Company's Quarries	Trouth and Company	Chickamauga, Walker County		Pit
Graysville Mining and Manufacturing Company Quarries	John D. Gray and later Graysville Mining and Manufacturing Company	Graysville, Catoosa county	1869 – 1912, at least	Pit, for lime
Hale Quarries	W. F. Hale	Graysville, Catoosa County	1901 – 1912, at least	Pit, for lime
Ducketts Mill		One mile N of Ducketts Mill, Whitfield County	c. 1900	Pit, for agricultural lime
Jet Black Marble Company Quarries	Jet Black Marble Company	Near Ducketts Mill, Whitfield County	c. 1900	Pits prospected for marble
Georgia Green Slate Company Quarry	Georgia Green Slate Company	Bolivar Station, Bartow County	c. 1910	Pit, for green slate
Ladd Lime Company Quarry	Ladd Lime Company	Two miles SW of Cartersville, Bartow County	By 1912	Pit, for lime and crushed stone
Howard Hydraulic Cement Company Property	Howard Hydraulic Cement Company	Cement Station, Bartow County	1850 – 1912, at least	Pit, for natural cement
Clifford Lime and Stone Company Quarry	Clifford Lime and Stone Company	Three miles NW of Kingston, Bartow County	By 1912	Pit, for lime
Paul F. Akin Property	Paul F. Akin	Cave Station, Bartow County	By 1912	Pit, for lime

T. Poole Maynard, *A Report on the Limestones and Cement Materials of North Georgia*, 1912. Geological Survey of Georgia, Bulletin No. 27.

Thomas L. Kesler, *Geology and Mineral Deposits of the Cartersville District, Georgia*, 1950. Geological Survey Professional Paper 224.

MANGANESE

Lot 613	Blue Ridge Mining Company, previously owned by Etowah Iron Company (sold in 1900)	Bartow County, Lot 613	Old Working & new in 1908	Open cut & one shaft
Lot 614	Blue Ridge Mining Company, previously owned by Etowah Iron Company (sold in 1900)	Bartow County, Lot 614	Worked at present (1908)	
Lot 542	Blue Ridge Mining Company, previously owned by Etowah Iron Company (sold in 1900)	Bartow County, Lot 542	Old Workings	
Lot 473	Blue Ridge Mining Company, previously owned by Etowah Iron Company (sold in 1900)	Bartow County, Lot 473		
Lot 464	Blue Ridge Mining Company, previously owned by Etowah Iron Company (sold in 1900)	Bartow County, Lot 464	Being worked as of 1908	Open suts, Tunnels, Prospect pits
Lot 465	Blue Ridge Mining Company, previously owned by Etowah Iron Company (sold in 1900)	Bartow County, Lot 465	Being worked as of 1908	1900-
Lot 391	Blue Ridge Mining Company, previously owned by Etowah Iron Company (sold in 1900)	Bartow County, Lot 391	Old workings	
Lot 113	Blue Ridge Mining Company, previously owned by Etowah Iron Company (sold in 1900)	Bartow County, Lot 113	A.P. Silva performed early mining on location	
Lot 460	Blue Ridge Mining Company, previously owned by Etowah Iron Company (sold in 1900)	Bartow County, Lot 460		Tunnels
Lot 330	Blue Ridge Mining Company, previously owned by Etowah Iron Company (sold in 1900)	Bartow County, Lot 330		Open cut
Lot 306	Blue Ridge Mining Company, previously owned by Etowah Iron Company (sold in 1900)	Bartow County, Lot 306		Open cuts, Test pits
Lot 303	Blue Ridge Mining Company, previously owned by Etowah Iron Company (sold in 1900)	Bartow County, Lot 303	1893	Open cut
Lot 274	Blue Ridge Mining Company, previously owned by Etowah Iron Company (sold in 1900)	Bartow County, Lot 274	Mined shortly after Civil War	
Lot 616	Blue Ridge Mining Company, previously owned by Etowah Iron Company (sold in 1900)	Bartow County, Lot 616		Tunnel

Lot 759	Blue Ridge Mining Company, previously owned by Etowah Iron Company (sold in 1900)	Bartow County, Lot 759		Open cut
Lot 171	Blue Ridge Mining Company, previously owned by Etowah Iron Company (sold in 1900)	Bartow County, Lot 171		Pit, Tunnel
Lot 174	Blue Ridge Mining Company, previously owned by Etowah Iron Company (sold in 1900)	Bartow County, Lot 174		Open cut
Lots 758, 827, 830, 831, & 903	Bartow Iron and Furnace Company	Bartow County, Lots 758, 827, 830, 831, & 903		Open cut, Tunnel
Stegall Property	John P. Stegall	Bartow County, Lots 905 & 906	1885-1908 (through press time)	Open cut, Tunnel
Stegall Property	John P. Stegall	Bartow County, Lot 826	1892	Open cut
Stegall Property	John P. Stegall	Bartow County, Lot 895		Open cut
Chumley Hill Property	Southern Mining Company, Previously by Pyrolusite Manganese Company & Dade Coal Company	Bartow County, Lots 314 & 315	1885-?	
Moccasin Mine	Southern Mining Company	Bartow County, Lot 143		Open cut
Lot 144	Southern Mining Company	Bartow County, Lot 144		Open cut
Big Spring lot	Southern Mining Company	Bartow County, Lot 109		Open cut
Allison Lot	Southern Mining Company	Bartow County, Lot 147		Open cut
Peachtree Lot	Southern Mining Company	Bartow County, Lot 148	1896	Open cut
Collins Lot	Southern Mining Company	Bartow County, Lot 214		Open cut
Franklin Lot		Bartow County, Lot 172		Open cut, Tunnel
R.B. & G.W. Satterfield Property		Bartow County, Lots 259 & 318	Worked during 1908	Open cut
Mansfield Brothers Property		Bartow County, Lots 402 & 403	1887	Open cut
W.H. Lanham Property	W.H. Lanham	Bartow County, Lot 477	mid 1880's	
N.P Lanham Property	N.P Lanham	Bartow County, Lots 475 & 476		Open cut

Freeman Lot	Mary J. Freeman	Bartow County, Lot 313		Open cut, Tunnel
Smith Lot	J.B. & F.A. Smith	Bartow County, Lot 226		Open cut
Heath Sisters Property		Bartow County, Lots 542 & 543		Open cut
Barrow Lot	Mr. Barrow	Bartow County, Lot 405		Open cut
Guyton Property		Bartow County, Lot 235		Open cut
F.A. & J.B. Smith Property		Bartow County, Lot 234		Open cut
Georgia Manganese & Iron Company's Property		Bartow County, Lots 115, 175, 187, 188, 189, & 245		Open cut
Peacock Lot		Bartow County, Lot 317		Open pit
Patillo Property		Bartow County, Lot 312		Open cut, Pits, Shaft
John Dobbs Estate		Bartow County, Lot 760		Open cut, Tunnel
Blue Ridge Ocher Company Lot	Blue Ridge Ocher Company	Bartow County, Lot 390	1859, 1866, 1902	Open cut
Milner- Harris Property	Leased to multiple companies, including the Etowah Company	Bartow County, Lots 271 & 272		Shafts, Open cut
Culver Lot	Hon. John W. Akin	Bartow County, Lot 304		
Stephenson Lot	Hon. John W. Akin	Bartow County, Lot 314	1901	Pit
White Lot	Hon. John W. Akin	Bartow County, Lot 315	1884-1885	Open cuts
Burford Lot	Southern Mining Company, Opened by Dade Coal Company	Bartow County, Lot 300		Open cuts
T. R. Jones Lot		Bartow County, Lot 190		
Dobbins Mine	Leased by E.H. Woodward in 1885, Prior to that the land was worked by the Bartow Mining & Manufacturing Company	Bartow County, Lots 270 & 271	1867- 1886	
Parrott Spring Property	Cherokee Ocher & Barytes Company	Bartow County, Lots 406 & 459		Open cuts, Shafts, Tunnels
Rowan Property	Rowan Property	Bartow County, Lot 264		Open cuts, Tunnels

HolLot		Bartow County, Lot 904		Tunnel, Open cuts
Hancock Property	D.H. Lopez, Previously owned by J.M. Couper	Floyd County, Lots 926 & 927		Pit
	D.H. Lopez	Polk County, Lots 1216 & 1217		Pit
Hendrix Tract	D.H. Lopez	Polk County, Lots 1232 & 1289	1892	
Scarbaugh Lot	D. H. Lopez	Polk County, Lot 180		Open cuts
Leak, Wright, & Peterson Property (Formerly the Watts Property)		Polk County, Lot 147	1888	
Hampton Property		Polk County, Lots 148 & 214	1888	Open cut
The Hickman Place		Floyd County, Lot 822	1896	
Lewis Ware Tract		Floyd County, Lot 1009		Pits
Simmons Property		Floyd County, Lot 924	1888	
Asbury Property		Floyd County, Lot 1,142		
W.B. Lowe Property		Floyd County, Lot 1,142	-1902	Open cut

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MARBLE

Polk Patterson Property		Fannin County	c. 1882	Pit
J. M. Garrison's Property		Lot 79, 8th Dist., First Section, Fannin County	By 1907	Prospecting pit
Gray Property	J. L. Gray	Cutcane Post Office, Fannin County	c. 1900	Pit, for lime

Mrs. Dean's Property		Lot 145, 8th Dist., First Section, Fannin County	c. 1900	Pit, for lime
Park Property		Lot 198, 8th Dist., 2nd Sect., Fannin County	c. 1900	Pit
Mineral Bluff Property		Mineral Bluff, Fannin County	By 1907	Pit, for lime and block
Cox Property		One mile E of Blue Ridge, (Lots 239, 240, 8th Dist., 2nd Sect.), Fannin County		Prospecting pits
Rapier Mill Creek Property		Lot 7, 8th Dist., 1st Sect., Fannin County	By 1907	Pit, for marble
Arp Property		Lot 42, 8th Dist., 1st Sect., Fannin County	By 1907	Prospecting pit
Dickey Property		At Toccoa River, Fannin County	c. 1900	Pit, for marble
Lacey Property	F. L. Lacey	Lot 182, 8th Dist., 2nd Sect., Gilmer County	c. 1900	Prospecting pits
Whitaker Property	P. B. Whitaker	Lots 272, 273, 10th Dist., 2nd Sect., Gilmer County	By 1907	Prospecting pits
Holt Property		Near White Path, Gilmer County	By 1907	Pit, for lime
		Lot 260, 10th Dist., 2nd Sect., Gilmer County	c. 1900	Pit, for marble
		Lots 142, 143, 12th Dist., 2nd Sect., Gilmer County	c. 1905	Prospecting pits
Gartrell Property (Marble Bluff)	Henry Gartrell	E side of Tolona Valley, Gilmer County	1893 – c. 1900	Pit
Godfrey Property		Lot 151, 5th Dist., 2nd Sect., Pickens County	c. 1866 – c. 1880	Pit, for tombstones
Eager Property		Four miles NE of Talking Rock, Pickens County	c. 1900	Prospecting pits

Perseverance Quarries	J. P. Harrison	Two miles E of Jasper, Pickens County	c. 1900	Pit, for marble
Southern Marble Company Quarry No. 1	Southern Marble Company	Marble Hill, Pickens County	1885, with material used in state capitol	Pit
Southern Marble Company Quarry No. 2 (Hall Quarry)	Southern Marble Company	Marble Hill, Pickens County	Late 1800s, early 1900s	Pit
Southern Marble Company Quarry No. 3	Southern Marble Company	Marble Hill, Pickens County	Late 1800s, early 1900s	Pit
Southern Marble Company Quarry No. 4 (Spring Quarry)	Southern Marble Company	Marble Hill, Pickens County	Late 1800s, early 1900s	Pit
Southern Marble Company Quarry No. 5 (Rhode Island Quarry)	Southern Marble Company	Marble Hill, Pickens County	Late 1800s, early 1900s	Pit
Southern Marble Company Quarry No. 6 (New York Quarry)	Southern Marble Company	Marble Hill, Pickens county	c. 1905 – 1907, at least	Pit
Piedmont Marble Quarry No. 1	Marble Hill Quarry Company	Marble Hill, Pickens County	c. 1900	Pit
Piedmont Marble Quarry No. 2	Marble Hill Quarry Company	Marble Hill, Pickens County	c. 1900	Pit
Piedmont Marble Quarry No. 3	Piedmont Marble Quarry No. 2	Marble Hill, Pickens County	c. 1900	Pit
Amicalola Marble Quarries (Herndon Property)	Atlanta Marble Company	Marble Hill, Pickens County	1892 – 1907, at least	Pit
Griffin Property	Georgia Marble Company	Marble Hill, Pickens County	c. 1900	Prospecting pit
Darnell Property	S. A. Darnell	Marble Hill, Pickens County	c. 1900	Prospecting pit
		Lot 82, 4th Dist., 2nd Sect., Pickens County		Prospecting pits
Old Creole Quarry	Georgia Marble Company	Tate, Pickens County	1884 – early 1900s	Pit, for marble
Creole No. 1	Georgia Marble Company	Tate, Pickens County	Late 1800s – 1907, at least	Pit, for marble
Creole No. 2	Georgia Marble Company	Tate, Pickens County	Late 1800s – 1907, at least	Pit, for marble

Cherokee No. 1	Georgia Marble Company	Tate, Pickens County	Late 1800s – 1907, at least	Pit, for marble
Cherokee No. 2	Georgia Marble Company	Tate, Pickens County	Late 1800s – 1907, at least	Pit, for marble
Cherokee Annex	Georgia Marble Company	Tate, Pickens County	Late 1800s – 1907, at least	Pit, for marble
Old Cherokee	Georgia Marble Company	Tate, Pickens County	Late 1800s – early 1900s	Pit, for marble
Etowah No. 1	Georgia Marble Company	Tate, Pickens County	Late 1800s – early 1900s	Pit, for marble
Etowah No. 2	Georgia Marble Company	Tate, Pickens County	Late 1800s – early 1900s	Pit, for marble
Kennesaw No. 1	Georgia Marble Company	Tate, Pickens County	Late 1800s – early 1900s	Pit, for marble
Kennesaw No. 2	Georgia Marble Company	Tate, Pickens County	Late 1800s – early 1900s	Pit, for marble
Kennesaw No. 3	Georgia Marble Company	Tate, Pickens County	Late 1800s – 1907, at least	Pit, for marble
		Nelson Station, Pickens County	c. 1900	Prospecting pit
Crain Property	G. W. Crain	Mabel Station, Cherokee County	c. 1900	Prospecting pit
Stafford Property	P. W. Stafford	Two miles W of Ball Ground, Pickens County	c. 1900	Prospecting pit
Cedar Ridge Property		Five miles E of Dalton, Whitfield County		Prospecting pits
American Black Marble Company Quarry	American Black Marble Company	Near Dalton, Whitfield County	1903	Pit
Eslinger Farm		Whitfield County	1800s	Pit, for tombstones
Six Mile Station Property		Seven miles S of Rome, Floyd County	c. late 1800s	Pit

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MICA

	J. B. Barron	Thomaston, Upson County	By 1919	
Freeman and Brown Mica Mine	M. R. Brown	Three miles S of Thomaston, Upson County	By 1919	
	F. M. Cagle	Seven miles S of Jasper, Pickens County	By 1919	
Kell Mine	H. E. Edwards	Near Clayton, Rabun County	By 1919	
Marchman's and Persens Mines	John B. McDonald	Near Yatesville, Upson and Monroe counties	By 1919	

H. S. Cave, *Historical Sketch of the Geological Survey of Georgia, Bibliography and Other Data*, 1922. Geological Survey of Georgia, Bulletin No. 39.

OCHER

Cherokee Ocher Mine	Cherokee Ocher Company	Lot 406, 4th Dist., Bartow County	1894 - 1941	Underground workings, then open pit
Knight Mine	J. M. Knight, for New Riverside Ochre Company	Lot 404, 4th Dist., Bartow County	1927 – 1950, at least; worked intermittently	Tunnels and shafts and open pit
Red No. 1 Hematite Mine	R. H. Renfroe, later George F. Hurt	Lot 300, 5th Dist., Bartow County	1870s – late 1890s	Open cut
Red No. 2 Mine	R. H. Renfroe, later George F. Hurt	Lots 299, 313, 314, 5th Dist., Bartow County	c. 1880 – 1890s	Open cuts
Roan Hematite Mine		Lot 616, 4th Dist., Bartow County	1877-1878	Open cuts, Tunnels

Thomas L. Watson, *A Preliminary Report on the Ocher Deposits of Georgia*, 1906. Geological Survey of Georgia, Bulletin No. 13.

Thomas L. Kesler, *Geology and Mineral Deposits of the Cartersville District, Georgia*, 1950. Geological Survey Professional Paper 224.

PYRITES

Hearn-McConnell Prospect	J. A. Hearn & Thomas M. McConnell	Eight miles NW of Bowdon (Lot 40, 9th Dist., 5th Sect.), Carroll County	1870s	Prospect shaft

Mount Zion Prospect	Ruff, Hartsock & Company; W. L. Tumlin	Lot 235, 10th Dist., Carroll County	1917	Prospect shaft
Cox Property	A. H. Cox	Lots 260, 276, 277, 7th Dist., 5th Sect., Carroll County	By 1918	Prospect shaft
Reeds Mountain Property	Southern Pyrites Ore Company (lease)	Lot 246, 7th Dist., 5th Sect., Haralson County, & Lot 259, 7th Dist., 5th Sect., Carroll County	c. 1850 – 1861, 1900 – 1918, at least	Open cuts, Tunnels
M. T. Earnest Property	H. O. Roop and J. Y. Blalock (mineral rights)	Lot 343, 7th Dist, Carroll County	c. 1860	Open pits, Shafts
M. A. Heartley Prospect	J. R. Heartley	Lot 254, 10th Dist., Carroll County	Late 1890s, early 1900s	Prospecting pits
Jenny Stone Prospect	Marietta Mining Company	Lot 222, 6th Dist., 5th Sect., Carroll County	c. 1850, c. 1886 (prospects); 1917 – 1918 (mining)	Open pit, Shafts
A. C. Watkins Prospect	Marietta Mining Company	Lot 196, 6th Dist., 5th Sect.	c. 1850, c. 1912, 1917 (prospects)	Shafts
Lasseter Prospect	James Lasseter heirs (mineral rights)	Lot 188, 5th Dist., 3rd Sect., Carroll County	c. 1850 (prospect); c. 1905	Shaft
Askew Prospect, aka Wisdom Prospect	Askew (mineral rights)	Lot 166, three miles W of Villa Rica, Carroll County		Shafts
T. J. Butler Prospect		Lot 255, 11th Dist., 2.5 miles S of Bowdon, Carroll County		Prospect pit
John D. Tarpley Property		Lot 17, 10th Dist., Carroll County		Prospect shaft
J. W. Garrett Prospect		Lot 18, 10th Dist. Two miles E of Bowdon, Carroll County		Prospect pit
J. T. McGuire Prospect		Lot 17, 9th Dist., near Kansas, Carroll County		Prospect blasting
Sam Bagwell Property	Virginia-Carolina Chemical Company (mineral rights)	Lot 223, 6th Dist., near Villa Rica, Carroll County		Prospecting shaft

W. T. Raburn Property	Ben McCain; later Mrs. M. Wallace	Lot 146, 6th Dist., 5th Sect., Haralson County	c. 1850, 1916-1917	Prospect shafts
M. W. Raburn	Mrs. M. Wallace (mineral rights)	Lot 220, 7th Dist., 5th Sect., Haralson County	1860s, 1917-1918	Prospect shafts
J. Humphrey Property	Mrs. M. Wallace	Lot 113, 6th Dist., 5th Sect., Haralson County	c. 1917	Prospect shafts
Jackson-McBride Prospect	M. P. Jackson & K. M. McBride (mineral rights)	Lots 17, 18, 8th Dist., 3rd Sect., Haralson County	1917-1918	Prospect shafts
Tallapoosa (Waldrop) Pyrite Mine	Georgia Pyrites Company (Arizona & Georgia Development Company)	Lot 932, 20th Dist., 3rd Sect., Haralson County	c. 1857, c. 1874 (prospects); 1881-1885, 1916-1918, at least	Open pit, Shafts
Smith-McCandless Prospect	A. A. Smith & John M. McCandless (mineral rights)	Lot 851, 20th Dist. 3rd Sect., NE corner of Haralson County	1830-1860 (prospects); 1890s-1900s	Shafts
Marvin M. Brown Property		Lot 183, 8th Dist., three miles S of Tallapoosa, Haralson County	By 1918	Prospects
R. Robertson Prospect		Lot 135, 8th Dist., three miles S of Tallapoosa, Haralson County		Prospects
W. J. Speight Property		Lot 1233, 20th Dist., Haralson County		Prospect shaft
R. F. Pace Property		Lot 1063, 20th Dist., Haralson County		Prospect shaft
J. G. Blackmon Property		Lot 1008, 20th Dist., Haralson County		Prospect pits
Keaton-Thomas Prospect	S. Thomas	Lot 78, 2nd Dist., 5th Sect., Douglas County	1854, 1887, 1917-1918 (prospects)	Prospect shafts
Sulphur Mining & Railroad Company Mine, aka Villa Rica Mine	Sulphur Mining and Railroad Company	Three miles NNW of Villa Rica, Carroll County	c. 1850, 1890-1895 (prospects); 1899-1917	Shafts

Swift Prospect	Swift & Company	Lots 1184, 1197, 1198, 1199, 19th Dist., 3rd Sect., Paulding County	1850s, 1889, 1905-1906 (prospects);	Prospect shafts
Helms Prospect	George H. Helms (mineral rights)	Lot 861, 19th Dist., 3rd Sect., Paulding County	c. 1850 (prospects)	Prospect shafts
McGarrity Prospect	B. T. McGarrity (mineral rights)	Lots 361, 362, 410, 19th Dist., 3rd Sect.	c. 1850, c. 1878 (prospects)	Prospect shafts
Rush-Banks Prospect	C. W. Rush	Lot 189, 19th Dist., 3rd Sect., Paulding County	1870s (prospects); 1883	Shafts
Little Bob Mine	American Minerals Company (leased by Georgia Mining Company)	Lots 624, 625, 672, 673, 695, 697, 744, 745, 2nd Dist., 3rd Sect., Paulding County	c. 1850 (prospects); 1885-1918, at least	Shafts
Mammoth Prospect	Mammoth Mining company	Lots 600, 601, 602, 624, 2nd Dist., 3rd Sect., Paulding County	1917-1918	Shafts
Shirley Mine	American Minerals Company; leased by Shirley Mining Company	Lot 526 2nd Dist., 3rd Sect., Paulding County	1917-1918	Shafts
Berg Prospect	Liberty Pyrites Company	Lots 482, 483, 527 2nd Dist., 3rd Sect., Paulding County	1909-1910 (prospects)	Prospect shafts
D. Ragsdale Prospect	D. L. Ragsdale	Lot 151, 19th Dist., 2nd Sect., Paulding County	c. late 1800s	Prospect shafts
Coggins and Smith Prospect, aka Mt. Tabor Mine	W. T. Coggins and S. E. Smith	Lot 116, 2nd Dist., 3rd Sect., Paulding County	c. 1905	Prospect shafts
S. O. Brown Property		Lot 1194, 19th Dist., near Draketown, Paulding County		Prospect shafts
W. P. Hutcheson Property	Mrs. E. W. Y. and Mrs. T. F. C. Allgood (mineral rights)	Lot 1043, 19th Dist., near Draketown, Paulding County	1870s	Prospect shaft
C. D. Allgood Prospect		Lot 916, 19th Dist., Paulding County		Prospect pit

C. B. McGarity Property		Lot 851, 19th Dist., Paulding County		Prospect shaft
W. W. Hunt & L. A. Moon Prospects		Lot 551, 2nd Dist.		Prospect pits
N. S. Vaughan Prospect		Lots 460, 461, 2nd Dist., near Hiram, Paulding County		Prospect blasting
Marietta Pyrite Mine	Marietta Mining Company	Near Marietta, Cobb County	c. 1880s (prospects); 1916-1918, at least	Shafts
C. J. Kamper Property	C. J. Kamper	Lot 372, 17th Dist., 2nd Sect., Cobb County	1902 (prospects), 1918	Shafts, tunnels
C. G. Wright Prospect		One mile E of Lost Mtn, Cobb County		Prospect shaft
Cash Prospect		Lot 34, 14th Dist., near Ben Hill, Fulton County	1854 (prospects); 1880s	Shafts, Tunnels
Bell-Star Mine	John G. Westerman (mineral rights); Southern Star Mining Company	Lots 829, 900, 901, 21st Dist., Cherokee County	c. 1900 – 1918, at least	Shafts
Rich Mine	H. Rich	Lots 127, 128, 161, 162, 14th Dist., 2nd Sect., near Canton, Cherokee County	c. 1850s (prospects); 1902 – 1918, at least	Shafts, Tunnels
Dickerson Prospect	Thomas Dickerson and heirs	Lots 856, 857, 872, 873, seven miles E of Canton, Cherokee County	1906 – before 1917	Shafts
Smith Prospect		Lots 802, 803, 855, 854, 3rd Dist., 2nd Sect., Cherokee County	1906 – before 1917	Shafts
Savilla E. McCrae Property	C. R. Fowler	Lot 233, 14th Dist., 2nd Sect., Cherokee County	c. 1907	Prospect shaft
Standard Mine (old Franklin Gold Mine)	Standard Pyrites Company	Lot 462, 3rd Dist., 2nd Sect., Cherokee County	1913-1918, at least (as pyrite mine)	Shafts, Tunnels
Swift Mine, aka Blake Mine	Henry W. Blake (1906-1911)	Lots 475, 476, 3rd Dist., 2nd Sect., Cherokee County	1906-1911, 1917-1918	Shafts

J. W. Thompson Property		Lots 850, 854, 4th Dist., Dawson County		Prospects
The Church Lot	R. E. Garmon	Lots 305, 257, 13th Dist., Dawson County	1917	Prospects
J. F. Shelton Property		Lots 241, 258, 13th Dist., Dawson County		Prospects
Chestatee Mine	Chestatee Pyrites & Chemical Corp.	Six miles E of Dahlonega, Lumpkin County	c. 1892 – 1918, at least	Shafts, Tunnels
Anderson Prospect		Lots 241, 242, 6th Dist., 1st Sect., Lumpkin and Union counties		Prospect tunnel
Moore Property		Lot 830, 12th Dist., 1st Sect., Lumpkin County		Prospecting pits
Dahlonega-Ellijay Public Road	G. W. Tonson & F. C. Cowan	Three miles W of Dahlonega, Lumpkin County		Prospecting pits
Danforth Property		Lot 162, 3rd Dist., six miles NNW of Cleveland, White County		Prospects
Robert Prospects		Five miles E of Lula, Banks County		Prospects
Panther Creek Propsect	Appalachian Corp.	Lot 208, 12th Dist., Habersham County		Prospects
Tom Coward Gap Prospect	John England (c. 1888)	Lots 48, 49, 6th Dist., Rabun County	c. 1850s, c. 1888	Prospects
Berrong (Johnson Copper) Prospect	J. Miles Berrong, Jesse N. Rice	Lot 196, 18th Dist., 1st Sect., Towns County		Prospects
Ivey Mount Prospect		Lot 157, 18th Dist, 1st Sect., Towns County	c. 1850s	Prospect shafts
Rich Knob Copper Prospect	J. Miles Berrong	Lot 91, 1st Dist., Towns County		Prospects
Mine No. 20	No. 20 Copper Mining Company	Lot 20, 9th Dist., 2nd Sect., Fannin County	c. 1861-1863; c. 1877; 1905-1918, at least	Shafts, Tunnels

Mobile Mine	Mobile & Atlanta Mining Company (1858); Harvey Schafer (1891)	Lot 59, 9th Dist., 2nd Sect., Fannin County	1858-1861; 1891-1892	Shafts, Tunnels
Phillips Prospect	George Phillips	Lot 21, 9th Dist., 2nd Sect., Fannin County	1917	Prospects
Sally Jane Prospect		Near Mobile Mine, Fannin County	Late 1850s	Prospect shafts
Jeptha Patterson Prospect		0.5 mile SW of Pierceville, Fannin County	1800s	Prospects
Mt. Pisgah Prospect	Flower Mining Company	Near Higdon, Fannin County	1850s, 1917 (prospects)	Prospects
Magruder or Seminole Mine	Seminole Mining Company (1899-1908); Georgia Copper Company (1917-1918)	Twelve miles NE of Washington, Wilkes and Lincoln counties	1852-1861 and 1880-1884 as Magruder gold mine; 1899-1908 as copper mine; 1917-1918	Shafts, Tunnels

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SAND AND GRAVEL

	Macon Fuel & Supply Company	Bibb County		
	General Building Supply Co	Chatham County		
	Atlanta Sand & Supply Company	Crawford County		
J.L. Chevis Property	Allen Sand Company	Crawford County		
	Davidson Granite Company	DeKalb County		
	Albany Line & Cement Company	Dougherty County		
	N.G. Watson	Floyd County		
	J.R. Lime & Sand Company	Talbot County		
	Kirkpatrick Sand & Cement Company	Talbot County		
	O.O. Brown Sand Company	Taylor County		

	Central of Georgia Sand Company	Taylor County		
	Kirkpatrick Sand & Cement Company	Taylor County		
	W.C. Harkey Sand Company	Taylor County		
	Mrs. Annie H. Mobley	Telfair County		
	Lumber City Sand & Concrete Company	Telfair County		
	E.B. White	Whitfield County		

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SERPENTINE

Verd Antique Marble Quarry	Verd Antique Marble Company	Two miles SW of Holly Springs (Lot 444, 15th Dist.), Cherokee County	c. 1898 – 1907, at least	Pit
Cole Property		Lot 490, 15th Dist., Cherokee County	c. 1900	Prospecting blasting

H. S. Cave, *Historical Sketch of the Geological Survey of Georgia, Bibliography and Other Data*, 1922. Geological Survey of Georgia, Bulletin No. 39.

SLATE

	Rockmart Shale Brick & Slate Company	Polk County, Lot 865		
Brown's South Quarry		Polk County		Pit
Brown's North Quarry		Polk County		Pit
The Southern States Portland Cement Company Property (Pritchard & Davis Opening, Oldest Quarry)	Georgia Slate Company	Polk County, Lot 925	1912	
Cherokee Slate Company (Old Dever Quarry, Tunnel Quarry, Small Quarry)	Cherokee Slate Company	Polk County, Lots 924, 926, 927		

Ellis Davis & Son Quarry	Mrs. Ellis Davis	Polk County, Lot, 865	Abandoned by 1918	
Sibley Quarters	Southern Slate Company	Polk County, Lots 873 & 928	1902	Quarry
Black Diamond Quarries	Black Diamond Slate Company	Polk County, Lots 657 & 712		
Portland Quarry		Polk County		Quarry
Georgia Green Slate Company Property	Georgia Green Slate Company	Bartow County	1908-1912	Quarry
American Potash Company		Bartow County, Lot 298	1918- ?	Quarry
Yancey Property	G.W. Davis, Leased to American Metal Company in 1917	Bartow County, Lot 317		Pit
McMillan Property (prospect only)	J.E. McMillan , Leased to American Metal Company	Bartow County, Lots 218		
Bennett Property	American Potash Company	Bartow County, Lot 298	1918	Quarry
	American Mica Company	Cherokee County, Lot 121	1915-1916	
	American Potash Company	Cherokee County, Lots 97 & 99	1917	
	Vithumus Company	Bartow County, Lot 118	1917-1918	
	American Mica Company	Pickens County, Lot 120		Pit
Kuhtman Place	Vithumus Company	Pickens County, Lot 119		Pit
Kim Padgett Property	American Potash Company	Pickens County, Lots 97 & 98		Pit
Burrell Property	American Potash Company	Pickens County, Lot 99		Pit

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H. S. Cave, *Historical Sketch of the Geological Survey of Georgia, Bibliography and Other Data*, 1922. Geological Survey of Georgia, Bulletin No. 39.

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SPECULAR HEMATITE

Bartow Mountain Mine			1941	
Red No 1	J.M. Neel Property	Bartow County, Lot 300		
Red No. 2	J.M. Neel Property	Bartow County, Lots 299, 313, & 314	1880, 1890s	
Roan Hematite Mine	W.R. Hale	County, Lot 616		

Thomas L. Kesler, *Geology and Mineral Deposits of the Cartersville District, Georgia*, 1950. Geological Survey Professional Paper 224.

TALC AND SOAPSTONE

	Cohutta Talc Company			
	Georgia Talc Company, Inc.	Murray County	-1921 (at time of book publishing)	

Oliver B. Hopkins, *A Report on the Asbestos, Talc and Soapstone Deposits of Georgia*, 1914. Geological Survey of Georgia, Bulletin No. 29.

H. S. Cave, *Historical Sketch of the Geological Survey of Georgia, Bibliography and Other Data*, 1922. Geological Survey of Georgia, Bulletin No. 39.

A. S. Furcron, A. C. Munyan, Garland Peyton, and Richard W. Smith, *Mineral Resources of Georgia*, 1938. Georgia Department of Natural Resources, Division of Mines, Mining and Geology, Geological Survey of Georgia.

APPENDIX 4. ARCHAEOLOGICAL RESEARCH DESIGN

Archaeology has a potential to provide new and important information on poorly understood aspects of Georgia's history and culture. Although gold mining is relatively well documented, and other mining activities in the state have been described, the specific techniques and technologies of mining in Georgia, how they were organized, who put them into operation, and how they affected local and regional communities have not been extensively studied. Archaeology provides an important means for addressing certain of these issues and raising questions about others. The following discussion provides topics of interest in dealing with archaeological and historic sites related to mining in north Georgia. These would be useful for guiding research and for evaluating historical significance under NRHP Criterion D (Noble and Spude 1997).

Webb and Norman (1998) and Jordan et al. (2003), respectively working at the Sixes and LaBelle gold mines in Cherokee County, developed research issues to guide the data recoveries at these sites. Research topics that these authors considered important dealt with the geography and geology of the mines, archaeological manifestations (features and artifacts) of mining technology, the communities associated with mines, and the internal and external economic situation of the mines, particularly what was the nature of its ownership and how did the mines influence the local economies (Webb and Norman 1998:6-8; Jordan et al. 2003:26-30).

It is important to note that although Georgia's mining history is known in a general way, it has not been widely studied either historically or archaeologically. The gold rush era is the most extensively studied mining industry of the state, but gold mining after the mid-nineteenth century has not been analyzed except in a cursory way. The state's other mineral industries have received only minimal attention from historians and archaeologists. Addressing the research themes discussed in this chapter thus offers a tremendous potential for better understanding the economic history of north Georgia and its landscape, as well as aspects of mining history, technology, and their social relations in the state.

The following discussion of research questions will take into account the work completed at the Sixes and LaBelle gold mines, but will mainly follow the guidelines set out by CALTRANS (2008) for the archaeology of mining in California. While the work that CALTRANS has completed is a good starting point for Georgia mining sites, as discussed in the preceding section it requires some modification to account for local history and circumstances. Moreover, as archaeologists in Georgia become more familiar with the database of sites and site types, research topics that are formulated to better explore the local situation can be developed.

Before discussing broader research themes, general procedures for dealing with mining sites at the survey and evaluation phases should be noted. One point to emphasize here is the use of standardized terminology to facilitate comparisons between features and sites, both for evaluating historic significance and conducting research. Additionally, methodological consistency is important in how these sites are handled. More systematic ways of identifying, describing, and classifying mining sites could provide a stronger basis for evaluations of historic significance (CALTRANS 2008:163).

CALTRANS (2008) put forth six research themes for dealing with mining sites in California. The topics are sometimes interrelated and can be addressed through archival and archaeological sources. They include:

1. Technology and technological development of mining
2. Historical ethnography/cultural history of mining
3. Ethnicity of distinct culture groups and ethnic interactions
4. Gender and family aspects of mining
5. Economic aspects of mining
6. Policy, law, and regulation of mining and self-governance

TECHNOLOGY

Remnants of mining technology comprise among the most visible features of mining sites, and include mine and mill tailings, shafts, adits, mill foundations, machinery mounts, tramways, headframes, and other structures (Hardesty 1988:12). Although written information is available about how various technological processes operated, these sources can be unreliable or misleading for various reasons and the study of actual processes can provide new information about how technological systems functioned (Gordon and Malone 1994:13). Moreover, the study of mining technology in Georgia can be informative about how general practices were adapted to local circumstances.

CALTRANS (2008:121) provided a list of technology-related questions for individual sites in California that can be adopted for use in Georgia as a first step. Although they refer to individual sites, consistently addressing these questions will help generate comparable data on mines and quarries in the state. As the material record of mining and quarrying in Georgia becomes better known these questions can be modified, appended, or removed as necessary.

- What was mined/quarried?
- During what time period or periods did the mine/quarry operate?
- Who owned, managed, or operated the mine/quarry. Was it individual, joint stock, corporate, investment, or other?
- Was the mine/quarry operated periodically or continuously and why?
- What processes does the site exhibit? How did they operate/function, and how did they change over time?
- How were processes adapted to specific conditions?
- Is there evidence of equipment reuse or replacement?
- Are the technologies older than those common during the time period the site was active?
- Is there evidence of vernacular innovation and under what conditions did this innovation take place?
- What influenced the choice of certain mining methods (labor costs, cost constraints, limited equipment availability, cultural preference, innovations)?
- Do mining/quarrying processes evident on the site agree with or differ from those documented in historic records or through oral history? If different, what might be the reason for these divergences?
- How was water delivered for industrial and domestic use? Did miners obtain water by developing sources on site or tapping into a regional system?
- Who made up the labor force and how did it change over time?
- Did changes in technology or management practices influence the layout of the mine, operations, or labor?

HISTORICAL ETHNOGRAPHY/CULTURAL HISTORY OF MINING

CALTRANS (2008:121-122) described this topic as dealing with the history or culture history of particular mining settlements or individuals. Research is completed by both historians and archaeologists. A benefit of this topic is that it combines historical studies of specific mining communities or individuals associated with mining and archaeological studies that can address more intimate details of mining communities and households. This theme encompasses topics such as settlement, individuals, and households and community.

Settlement in this context refers to attempts to establish mining camps and how they grow into mining communities. Emphasis is placed on how the settlement process takes place and the social, economic, and political forces that shape it. The study of individuals is important when the archaeological or material remains at a site can be associated with the people who worked and lived there. Finally, the topic of households and community covers domestic units, individual or group ("community") associated with mining industries. Individual and groups of domestic units can be compared between different sites (CALTRANS 2008:122-126). Research questions associated with this theme are:

- What activities/events took place at the site?
- What time period or periods are represented?
- Was there more than one occupation?
- Is there temporal variation within or between loci or feature systems?
- Was settlement exclusively associated with mining or did other types of services develop to support the mine and the miners?
- Who lived on the site (numbers, gender, ethnic or cultural groups, class, age, known individuals) and did the demography change through time? If so, how and why?
- What was the duration of occupation and mining activity?
- Are cycles of occupation abandonment evident?
- Is the migration or settlement pattern evident (early transitory or long-term)?
- Is variation in population groups (e.g., family, groups of men, single, class or ethnic segregation) evident within discernable households?
- How did people at this site respond to local, regional, statewide, or national events? Is it possible to distinguish causal relationships with larger societal trends from the archaeological remains?

ETHNICITY OF DISTINCT CULTURE GROUPS AND ETHNIC INTERACTIONS

Issues related to ethnicity have been of particular interest to archaeologists and mining sites in the western United States have provided important sources of archaeological data. While the mix of different ethnicities and nationalities is rather well known for that region of the county, it is not clear how culturally diverse Georgia mines were. Reports of the gold rush era suggested the presence of African Americans, European immigrants, and possibly Cherokee miners (Williams 1993:88). Workers in late nineteenth- to early twentieth-century mining and quarrying operations have not been identified as extensively, but the stone trades of this era attracted immigrants from Italy and other European countries (Ouzts 2004). It is not known if these workers formed distinct communities. On the other hand, like other economic activities in Georgia, contingents of African American laborers were present in mining and quarrying operations and it would be important to examine if they formed communities based on ethnicity and occupation.

For this research topic, CALTRANS (2008:139-140) recommended the following questions for mining sites in the west. These have varying usefulness in Georgia because of a potentially different cultural and racial context:

- Do archival sources indicate the presence of ethnic, cultural, or national variation at the site or its vicinity?
- Is there a historic context for the presence of this group and identification of their immigration and work history?
- What links did this group maintain with the homeland?
- What is the time period of the occupation and were there multiple occupations of the site and or periods of abandonment in between?
- Who worked at the site and did different ethnic groups work together or sequentially? Is there evidence of interaction between different ethnic groups?
- Are there archaeological markers of different ethnic/cultural groups?
- Is there evidence for how space was organized or the types of structures used, and what does this evidence indicate about ethnic behavior?
- Is there other evidence of this ethnic group in the vicinity or region?
- Was the site isolated or part of a community?
- How does the evidence for ethnic groups on this site compare to similar sites? How does it compare to Euroamerican sites of the same time? Is there evidence that traditional cultural practices were maintained? What cultural practices were adapted from Euroamerican or other cultures?
- Are ethnically distinctive mining/quarrying methods or technological innovations present?
- Does the site help distinguish types of mining methods that were employed by distinct groups through time, by region, and for different mineral types?
- Were the site occupants independent workers or employed by a mining/quarrying operation?
- How did they workers organize themselves?
- How did organization change over time and among different groups of workers?

GENDER AND FAMILY ASPECTS OF MINING

Issues dealing with gender and family cover both the work and domestic spheres of mining and quarrying. While mines and quarries would be considered male-dominated places, women and children did participate in certain aspects of the trade as they did in most nineteenth- and twentieth-century industrial operations. They were also present in the domestic setting associated with mines and quarries. These industries, however, could have unique domestic and workplace arrangements. While some mining interests in the state had workers' cottages at the mines which could accommodate families. Others, particularly the coalmines, had barracks for convict laborers and the domestic sphere would have been solely male and institutional. Moreover, the residential situations of Georgia miners and quarry workers are not entirely clear. In some instances, towns and villages were nearby the work area, while in others the mines and quarries might have been rather isolated, requiring domestic accommodations to be established for the sake of the workers. The domestic situations associated with Georgia mineral industries has not been examined in detail and the leading questions can help better delineate and understand the situation (CALTRANS 2008:144):

- Is it possible to identify women or children at mining/quarrying sites in the archaeological record?
- What roles did women and/or children have in mining/quarrying support services? What are the archaeological manifestations of these roles? Is it possible to extrapolate those indicators to sites without known associations?
- How did mining households or communities containing women and/or children differ from those without? Is it possible to distinguish cultural or behavioral themes in such differences?
- Is there a correlation between numbers of females and stability? Is it possible to distinguish driving forces for stability and could women be the force historically attributed to them?
- Is there a gender disparity in proximity of domestic occupation to mine/quarry sites? What does this indicate about the nature of female participation in settlement patterns? Does it differ by mineral?
- What challenges faced women who became sole owners of mines? Can the archaeological record expose differences between female- and male-owned mines?
- Is the capitalization of solely women-owned mines/quarries different than male owned mines? In essence could women finance mining/quarrying operations through stocks or banking institutions or through other means?
- Were women owned mines/quarries related to specific minerals or precious metals?
- Did women who were the sole owners of mines/quarries participate in the daily operations of the mine? How might this participation appear in the archaeological record?

ECONOMIC ASPECTS OF MINING AND QUARRYING

This topic relates to the production and consumption of commodities (Nobel and Spude 1997:17). The theme encompasses economics of mining and quarrying at various scales from the household to the world system (CALTRANS 2008:144). One of the topics that can be investigated under this heading is the economic niche of mining/quarrying, particularly how it generated income for various individuals as a full-time profession, seasonal labor, investment opportunity, or other arrangement. With respect to consumption, the topic can deal with the materials different social, cultural, and occupational classes purchased. Additionally, consumption can address the market development and relationships that mining regions had with the outside world. This might include the development of boomtowns or communities that arose to provide services and distribution points for mining areas. For commodity production, this theme includes issues related to how mining and quarrying operations were financed and how different capitalization strategies influenced operations. Questions that can guide research into the economics of mining and quarrying include the following (CALTRANS 2008:148).

- Who invested in the mine/quarry (the miners, joint-stock company, outside capital)? Was the venture heavily capitalized?
- Is there evidence of expensive and/or imported materials and/or technology?
- What types of access to markets was available during different periods?
- At what pace did industrial infrastructure develop?
- What role did the mine/quarry play in the region's growth and economic development?
- What other businesses were present and in what phase did they develop?
- Are a variety of socio-economic classes evident at the site? Is class segregation evident?
- How does the material culture of different classes compare? How does the socioeconomic profile of household and the site change through time?
- Was mining/quarrying only a facet of a more complex survival strategy that included other pursuits such as farming or wage labor?
- Where did the miners/quarry workers get their food and other goods and services? How did this change over time?
- Did miners invest much time preparing food at home or did they eat away from their residences? Did they reside in rooming houses and eat at boarding houses?
- How did the role of mining/quarrying change over time for individuals, households, communities, or regions?

POLICY, LAW, AND REGULATION OF MINING AND SELF-GOVERNANCE

TThis theme deals with the nature and influence of federal, state, and local regulations on mining activities. For California, CALTRANS (2008:149) noted that research into this topic had mostly referred to the gold rush and dealt with three principal topics: crime, development of mining law and water rights systems, and the relationship of the state government to federal government. These topics have generally been the purview of historians. However, archaeologists can contribute information to certain topics, such as the effects of mineral industries on the physical environment, the impacts of laws and policies on land use and water rights, and efforts adapt mining/quarrying practices to environmental and labor regulation. Specific questions to address this theme are (CALTRANS 2008:152-153).

- Are there mining codes covering the site area?
- What environmental changes are visible at the site and can those changes be attributed to a specific phase of occupation or specific occupants?
- Is there evidence of responses to increasing government regulation of mineral industries such as increased environmental restrictions?
- Is there evidence of adaptation to changing water policies, such as reliance on water conserving technologies?
- How many miners/quarry workers worked the site and how were they organized? How did the organization of workers change through time?
- Is there evidence of corporate or individual responses to increasing government regulation of mining such as increased safety requirements?
- Can changes in company policy be correlated to changes of technology or social behavior at the site?
- What type of social order is evident at the site?
- Does the site exhibit a sense of organized community (e.g., a large population of permanent settlers) or was it predominantly a transient male population?
- Were social boundaries established or enforced based on ethnicity, class, or other social or political factors? Is there evidence of social inequality?

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